PESTICIDES ABSTRACTS

January 1975 - Vol. 8, No. 1
Abstracts 75-0001-0246
PSTAB 08(01)001-059 (1975)

ANNUAL LIST OF PERIODICALS

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS

TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 8 January 1975 No. 1

Page

List of Periodicals 1

General 1
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 9
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 14
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 19
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 52
(Preparation of samples; analytical methods; instrumentation)

Preface

Included in this issue is a list of sources from which at least one article was abstracted for publication in either Volume 6 (1973) or Volume 7 (1974); however, more than 2500 primary serials and secondary sources, books, and non-periodical publications are screened. Journal titles are abbreviated according to the format of *Chemical Abstracts Service Source Index Quarterly* (CASSI). Japanese publications are listed by the Hepburn romanization of the complete title which is followed by the English equivalent, abbreviated according to CASSI, in parentheses. For additional convenience, English titles of Japanese periodicals are listed separately and cross-referenced.

ACFAS (ASS CAN FR AV SCI)
ACTA AGR SCAND
ACTA AGRON (BUDAPEST)
ACTA AGRON (PALMIRA)
ACTA ANESTHESIOL BELG
ACTA BIOCHIM IRAN
ACTA BIOL MED GER
ACTA BOT
ACTA EMBRYOL EXP
ACTA ENDOCRINOL PANAMER
ACTA ENTOMOL BOHEMOSLOV
ACTA HAEMATOL
ACTA HEPATO-GASTROENTEROL
ACTA HISTOCHEM
ACTA HORT (THE HAGUE)
ACTA MED IRAN
ACTA MED IUGOSLAV
ACTA MED POL
ACTA MED SCAND
ACTA MICROBIOL
ACTA MICROBIOL POL
ACTA MORPHOL ACAD SCI HUNG
ACTA NEUROPATHOL
ACTA PARASITOL POL
ACTA PATHOL JAP
ACTA PATHOL MICROBIOL SCAND
ACTA PHARM HUNG
ACTA PHARM JUGOSLAV
ACTA PHARMACOL TOXICOL
ACTA PHYSIOL ACAD SCI HUNG
ACTA PHYSIOL POL
ACTA PHYSIOL SCAND
ACTA PHYTOPATHOL
ACTA POL PHARM
ACTA VET (BRNO)
ACTA VET (BUDAPEST)
ACTA VET SCAND
ACTIV NERV SUPER
ADVAN AGRON
ADVAN ANAL CHEM INSTRUM
ADVAN APPL MICROBIOL
ADVAN CHEM SER
ADVAN INTERN MED
ADVAN NEUROL SCI SEE SHINKEI KENKYU NO SHIMPO
AEROSP MED
AG ACTIONS
AGR AMER
AGR AVIAT
AGR BIOL CHEM (TOKYO)
AGR CHEM MON SEE KONGETSU NO NOYAKU
AGR ENG
AGR HORT SEE NOGYO OYOBI ENGEI
AGR MERCH
AGR N IR
AGR POLLUT GR LAKES BASIN
AGR RES
AGRICHEM AGE
AGROCHEMIA (PRAGUE)
AGROCHIMICA
AGROHEMIJA
AGROKEM TALAJTAN
AGROKHIMIYA
AGRON J
AGRON TROP
AICHE IND PR DES WATER
AICHE SYMP SER
AIN SHAMS MED J
AKITA J RURAL MED SEE AKITA-KEN NOSON IGAKKAI ZASSHI
AKITA-KEN EISEI KAGAKU KENKYU
  (AKITA PREFECT INST PUB HEALTH)
AKITA-KEN NOSON IGAKKAI ZASSHI (AKITA J RURAL MED)
AKUSH GINEKOL (SOFIA)
ALIMENT VIE
ALLG FORST JAGDZTG
ALLG FORSTZ
ALLIONIA
AMBIO
AMER BEE J
AMER CHEM SOC DIV WATER AIR WASTE CHEM GEN PAP
AMER FAMILY PHYSICIAN
AMER FRUIT GROW
AMER IND HYG ASS J
AMER INST AERONAUT ASTRON
AMER J AGR ECON
AMER J DIG DIS
AMER J DIS CHILD
AMER J ENOL VITICULT
AMER J EPIDEMIOL
AMER J MED TECHNOL
AMER J PATHOL
AMER J PHYSIOL
AMER J PSYCHIAT
AMER J TROP MED HYG
AMER J VET RES
AMER LAB
AMER LUNG ASS BULL
AMER MIDL NATUR
AMER REV RESP DIS
AMER VEG GROW
AMER ZOOL
AN BROMATOL
AN INST CENT CERCET AGR BUCHAREST
AN UNIV BUCURESTI
ANAL BIOCHEM
ANAL CHEM
ANAL CHIM ACTA
ANAL INSTRUM
ANAL LETT
ANALUSIS
ANALYST (LONDON)
ANAT REC
ANDHRA AGR J
ANGEW CHEM INT ED ENGL
ANKARA UNIV TIP FAK MECM
ANN ACAD MED SINGAPORE
ANN AGR FENN
ANN APPL BIOL
ANN BIOL ANIM BIOCHIM BIOPHYS
ANN BULL INT DAIRY FED
ANN DIR ETUD EQUIP SEITA
ANN ENDOCRINOL
ANN ENTOMOL SOC AMER
ANN FAC AGR UNIV BARI
ANN FALS EXPERT CHIM
ANN GEMBLOUX
ANN HYDROBIOL
ANN INT MED
ANN MED VET
ANN N Y ACAD SCI
ANN NUTR ALIMENT
ANN OPHTHALMOL
ANN PEDIAT SEE SEM HOP

ANN PHYTOPATHOL
ANN SCLAVO
ANN SOC BELG MED TROP
ANN TECHNOL AGR
ANN ZOOL ECOL ANIM
ANN ZOOL FENN
ANNU REP GUMMA PREFECT INST PUB HEALTH CENT STUDY ENVIRON POLLUT SEE GUMMA-KEN EISEI KENKYUSHO GUMMA-KEN,KOGAI KENKYU SENTA NENPO
ANNU REP HIROSHIMA PREFECT SEE HIROSHIMA-KEN SHOWA 46 NENDO GYOMU NENPO
ANNU REP KANAGAWA PREFECT PUB HEALTH LAB SEE KANAGAWA-KEN EISEI KENKYUSHO NENPO
ANNU REP KUMAMOTO PREFECT INST PUB HEALTH SEE KUMAMOTO-KEN EISEI KENKYU SHOHO
ANNU REP MIE PREFECT INST PUB HEALTH SEE MIE-KEN ESIEI KENKYUSHO NENPO
ANNU REP NAGASAKI PREFECT HYG LAB SEE NAGASAKI-KEN EISEI KENKYU NENPO
ANNU REP NARA PREFECT INST SEE NARA-KEN EISEI KENKYU SHOHO
ANNU REP OKAYAMA PREFECT PUB HEALTH LAB SEE OKAYAMA-KEN EISEI KENKYUSHO NENPO
ANNU REP SANKYO RES LAB SEE SANKYO KENKYUSHO NENPO
ANNU REP SHIMANE PREFECT INST PUB HEALTH SEE SHIMANE-KEN EISEI KENKYUSHO NENPO
ANNU REP SOC YAMAGUCHI IND HEALTH SEE YAMAGUCHI SANGYO IGAKU NENPO
ANNU REP TOKYO METROP LAB MED SCI SEE TOKYO-TORITSU EISEI KENKYUSHO NENPO
ANNU REP TOKYO METROP LAB PUB HEALTH SEE TOKYO-TORITSU EISEI KENKYUSHO KENKYU NENPO
ANNU REP WAKAYAMA PREFECT INST PUB HEALTH SEE WAKAYAMA-KEN EISEI KENKYUSHO NENPO
ANNU REP YAMAGUCHI PREFECT RES INST SEE YAMAGUCHI-KEN EISEI KENKYUSHO NENPO
ANNU REP YAMANASHI PREFECT INST PUB HEALTH SEE YAMANASHI KENRITSU EISEI KENKYUSHO NENPO
ANNU REV BIOCHEM
ANNU REV ECOL SYST
ANNU REV MICROBIOL
ANNU REV PHARMACOL
ANNU REV PLANT PHYSIOL
ANTONIE VAN LEEUWENHOEK J MICROBIOL SEROL
ANZ SCHAEDLINGSK PFLANZEN
APIDOLOGIE
APPL MICROBIOL
ARCH ANAT MICROSC
ARCH BIOCHEM BIOPHYS
ARCH DERMATOL
ARCH DERMATOL FORSCH
ARCH ENVIRON CONTAM TOXICOL
ARCH ENVIRON HEALTH
ARCH EXP VETERINAERMED
ARCH GEFLUEGELK
ARCH GESCHWULSTFORSCH
ARCH HISTOL SEE SAIBOKAKU BYORIGAKU ZASSHI
ARCH HYDROBIOL
ARCH INST CARDIOL MEX
ARCH INT PHARMACODYN THER
ARCH INT PHYSIOL BIOCHIM
ARCH KLIN EXP DERMATOL
ARCH LEBENSMITTELHYG
ARCH MAL PROF MED TRAV SECUR SOC
ARCH MIKROBIOL
ARCH NEUROL (CHICAGO)
ARCH PATHOL
ARCH PFLANZENSCHUTZ
ARCH PHARM (WEINHEIM GER)
ARCH TOXIKOL
ARCH UNION MED BALKAN
ARCH VET
ARCISP S ANNA FERRARA
ARCTIC
ARH FARM
ARH HIG RADA TOKSIKOL
ARH POLJOPR NAJKE
ARKANSAS FARM RES
ARKH ANAT GISTOL EMBRIOL
ARM KHIM ZH
ARQ INST BIOL (SAO PAULO)
ARZNEIM-FORSCH
ASIAN MED J
ASS FOOD DRUG OFF US QUART BULL
ATL SALMON J
ATMOS ENVIRON
ATTI SOC ITAL SCI VET
AUK
AUST CHEM PROCESS ENG
AUST J AGR RES
AUST J BIOL SCI
AUST J DAIRY TECHNOL
AUST J EXP AGR ANIM HUSB
AUST J ZOOL
AUST VET J
AUSTRALAS RADIOL
AVIAN DIS
BACTERIOL PROC
BACTERIOL REV
BAIOTEKU (BIOTECH)
BECKMAN REP
BEE WORLD
BEHAVIORAL BIOL
BEITR GERICHTL MED
BEITR PATHOL ANAT ALLG
BEITR TABAKFORSCH
BER KERNFORSCHUNGSANLAGE JUELICH
BER LANDWIRT
BIOCHEM BIOPHYS RES COMMUN
BIOCHEM J
BIOCHEM PHARMACOL
BIOCHEM PHYSIOL PFLANZ
BIOCHEMISTRY
BIOCHEMISTRY (TOKYO) SEE SEIKAGAKU
BIOCHIM BIOPHYS ACTA
BIOCHIMIE
BIO-DYNAMICS
BIOL CHEM VYZ ZVIRAT
BIOL CONSERV
BIOL GLASN
BIOL NAUKI
BIOL RUNDSCH
BIOL ZENTRALBL
BIOL ZH ARM
BIOLOGIA
BIOLOGICO
BIOSCIENCE
BIOTECH SEE BAIOTEKU
BIOTECHNOL BIOENG
BIOTROPICA
BIRD STUDY
BITKI KORUMA BUL
BIUL INST OCHR ROSL
BIUL WARZYWNICZY
BLUE JAY
BOCHU-KAGAKU (SCI PEST CONTR)
BOEI EISEI (NAT DEF MED J)
BOL AS MED P R
BOL CHIL PARASITOL
BOL OF SANIT PANAMER
BOL SOC QUIM PERU
BOLL LAB CHIM PROV
BOLL SECT PLAGUICIDAS CENT TOXICOL UNIV NAC B AIRES
BORGYOGY VENEROL SZEMLE
BRAIN RES
BRATISLAV LEK LISTY
BRIT J ANAESTH
BRIT J CLIN PRACT
BRIT J DERMATOL
BRIT J EXP PATHOL
BRIT J HAEMATOL
BRIT J IND MED
BRIT J PHARMACOL
BRIT J PREV SOC MED
BRIT MED J
BRIT POULT SCI
BRIT VET J
BROMATOL CHEM TOKSYKOL
BRUXELLES-MED
BUDAPESTI KOZEGISZEGUGY
BUL SHKENCEAVE BUJQESORE
BULL ACAD NAT MED PARIS

BULL ACAD SCI KOREAN PEOPLE'S DEMOCRAT REPUB
  SEE CHOSON MINJUJUUI INMIN KONGHWAGUK KWAHAGWON TONGBO
BULL ACAD VET FR
BULL AGR CHEM INSP STA SEE NOYAKU KENSASHO HOKOKU
BULL AVES
BULL CANCER
BULL ENTOMOL RES
BULL ENTOMOL SOC NIGER
BULL ENVIRON CONTAM TOXICOL
BULL EXP BIOL MED (USSR)
BULL GOV FOREST EXP STA SEE RINGYO SHIKENJO KENKYU HOKOKU
BULL GRAIN TECHNOL
BULL HYOGO PREFECT PUB HEALTH LAB
  SEE HYOGO-KEN EISEI KENKYUSHO KENKYU HOKOKU
BULL INST CHEM RES KYOTO UNIV
BULL INST PUB HEALTH (TOKYO)
  SEE KOSHU EISEIIN KENKYU HOKOKU
BULL JAP SOC SCI FISH SEE NIPPON SUISAN GAKKAISHI
BULL KAGAWA PREFECT AGR EXP STA
  SEE KAGAWA-KEN NOGYO SHIKENJO KENKYU HOKOKU
BULL KANAGAWA PUB HEALTH LAB
  SEE KANAGAWA-KEN EISEI KENKYUSHO KENKYU HOKOKU
BULL MAR SCI
BULL MT DESERT ISL BIOL LAB
BULL NAT INST HYG SCI TOKYO SEE EISEI SHIKENJO HOKOKU
BULL PHYSIO-PATHOL RESP
BULL SCI CONS ACAD SCI ARTS RSF YOUGOSLAVIE SECT A
BULL SOC CHIM FR
BULL SOC FR DERMATOL SYPHILIGR
BULL SOC PHARM MARSEILLE
BULL TRAV SOC PHARM
BULL WHO
BUNDESGESUNDHEITSBLATT
BUNSEKI KAGAKU (JAP ANAL)
BUR SPORT FISH WILDL SPE SCI RE
BUR SUGAR EXP STA QUEENSL
BYULL EKSP BIOL MED
C R ACAD SCI PARIS SER D
C R ASS ANAT
C R SEANCES MENS SOC SCI NATUR PHYS MAROC
C R SOC BIOL
CAFE CACAO THE
CAH NUTR DIET
CALIF AGR
CALIF FISH GAME
CALIF HEALTH
CALIF MAR RES COMMUN
CAN ENTOMOL
CAN FOR SERV CHEM CONTR RES INS
CAN HOSP
CAN INST FOOD TECHNOL J
CAN J BIOCHEM
CAN J BOT
CAN J CHEM
CAN J COMP MED
CAN J GENET CYTOL
CAN J MICROBIOL
CAN J PHYSIOL PHARMACOL
CAN J PLANT SCI
CAN J PUB HEALTH
CAN J SOIL SCI
CAN J SPECTROSC
CAN J ZOOL
CAN VET J
CAN WILDL SERV REP
CANCER
CANCER (TOKYO) SEE GANN
CANCER RES
CARBON (OXFORD)
CASE HIST SEE KARUTE
CENT AFR J MED
CEREAL CHEM
CEREAL SCI TODAY
CERES
CESK DERMATOL
CESK FYSIOL
CESK HYG
CESK PATOL
CEYLON COCONUT QUART
CEYLON MED J
CHEM AGE INDIA
CHEM ANAL (WARSAW)
CHEM-BIOL INTERACTIONS
CHEM BRIT
CHEM CHEM IND (OSAKA) SEE KAGAKU TO KOGYO (OSAKA)
CHEM CHEM IND (TOKYO) SEE KAGAKU TO KOGYO (TOKYO)
CHEM COMMUN
CHEM CONTR RES INST REP
CHEM ENG (LONDON)
CHEM ENG NEWS
CHEM HEALTH REP
CHEM IND (LONDON)
CHEM IND (TOKYO) SEE KAGAKU KOGYO
CHEM-ING TECH Z
CHEM LISTY
CHEM PAPER PROCESSING
CHEM PHARM BULL
CHEM PRUM
CHEM REGUL PLANTS SEE SHOKUBUTSU NO KAGAKU CHOSETSU
CHEM RUNDSCH
CHEM TECH (AMSTERDAM)
CHEM TECH (LEIPZIG)
CHEM TECHNOL
CHEM WEEK
CHEM WEEKBL
CHEM ZVESTI
CHEN-ZTG CHEM APP
CHEMISTRY
CHEMOSPHERE
CHEMOTHERAPY (TOKYO)
  SEE NIPPON KAGAKU RYOHAGAKUKAI ZASSHI
CHESAPEAKE SCI
CHEST
CHIM ACTUAL
CHIMIA
CHIN MED J
  SEE CHUNG-HUA I HSU EH TSA CHIH WAI WEN PAN
CHIRURGIE
CHIRYO (J THER)
CHOSON MINJUJUUI INMIN KONGHWAGUK KWAHAGWON TONGBO
  (BULL ACAD SCI KOREAN PEOPLE'S DEMOCRAT REPUB)
CHROMATOGRAPHIA
CHUNG-HUA I HSU EH TSA CHIH WAI
CITRUS IND
CITRUS VEG MAG
CIV ENG (NEW YORK)
CLIN ALL-ROUND SEE SOGO RINSHO
CLIN CHEM
CLIN CHIM ACTA
CLIN ELECTROENCEPHAL SEE RINSHO NOHA
CLIN NEUROL SEE RINSHO SHINKEIGAKU
CLIN PEDIAT
CLIN PHARMACOL THER
CLIN RADIOL
CLIN RES
CLIN TOXICOL
CLIN TOXICOL AGR PESTIC
CLIN VET
COEUR MED INTERNE
COLLECT ABSTR USC JAPAN
COLUMBIA LAW REV
COMMUNITY HEALTH (BRISTOL)
COMP BIOCHEM PHYSIOL
COMP GEN PHARMACOL
COMPOST SCI
CONDOR
CONGENITAL ANOMALIES SEE SENTEN IJO
CONTEMP AGR
CONTRIB IST RIC AGRAR MILAN
COPEIA
CORNELL VET
COTON FIBRES TROP
CRIT REV ANAL CHEM
CRIT REV ENVIRON CONTR
CRIT REV FOOD TECHNOL
CRIT REV MICROBIOL
CRIT REV TOXICOL
CROP SCI
CROPS SOILS MAG
CURR FARM ECON
CURR SCI
CYTOBIOS

CZAS STOMATOL
CZ-CHEM-TECH
DAN KEMI
DAN ORNITHOL FOREN TIDS
DEUT GESUNDHEITSW
DEUT GEWASSERK MITT
DEUT LEBENSM-RUNDSCH
DEUT MED WOCHENSCHR
DEUT TIERAERZTL WOCHENSCHR
DEVELOP IND MICROBIOL
DEVELOP PSYCHOBIOL
DISS ABSTR INT
DISS PHARM PHARMACOL
DOKL AKAD NAUK SSSR
DOKL AKAD NAUK TADZH SSSR
DOKL BIOL SCI
DOKL BOLG AKAD NAUK
DOKL SEL'SKOKHOZ AKAD SOFIA
DOKL TSKHA (TIMIRYAZEV SEL'SKOKHOZ AKAD)
DOKL VSES AKAD SEL'SKOKHOZ NAUK
DOKL VSES LENINGRAD AKAD SEL'SKOKHOZ
DOPOV AKAD NAUK UKR RSR SER B
DOWN EARTH
DRUG INFORM J
DRUG METAB DISPOSITION
DRUG METAB REV
DYEST CHEM SEE SENRYO TO YAKUHIN
E AFR MED J
ECOL MONOGR
ECOL TODAY
ECOLOGY
ECON MED ANIM
ECON PLANN
EDISON ELEC INST BULL
EGESZSEGTUDOMANY
EHIME-KENRITSU EISEI KENKYUSHO (REP EHIME PREFECT HYG LAB)
EISEI KAGAKU (J HYG CHEM)
EISEI SHIKENJO HOKOKU (BULL NAT INST HYG SCI)
EIYO TO SHOKURYO (FOOD NUTR)
EKSP MED MORFOL
EKSP VOD TOKSIKOL MATER VSES SIMP
ELECTROENCEPHALOGR ELECTROMYOGR SEE NOHA TO KINDENZU
ELELMISZERVIZSGALATI KOZLEM
EMERGENCY MED
ENDOCRINOL EXP
ENDOCRINOLOGY
ENVIRON AFF
ENVIRON BIOL
ENVIRON CONTR
ENVIRON CREATION SEE KANKYO SOZO
ENVIRON ENTOMOL
ENVIRON HEALTH PERSPECT
ENVIRON LETT
ENVIRON PHYSIOL BIOCHEM
ENVIRON POLLUT
ENVIRON POLLUT MANAGE
ENVIRON QUAL MAG
ENVIRON QUAL NOTE
ENVIRON RES
ENVIRON SCI TECHNOL
ENVIRONMENT
EOS TRANS AMER GEOPHYS UNION
ERNAEHRUNGSFORSCHUNG
ERNAEHRUNGS-UMSCHAU
ESSAYS TOXICOL
ETHIOP MED J
EUR J BIOCHEM
EUR J CLIN PHARMACOL
EUR J IMMUNOL
EUR J PHARMACOL
EUR J TOXICOL
EURO-SPECTRA
EXP AGR ANIM HUSB
EXP CELL RES
EXP MOL PATHOL
EXP PARASITOL
EXP PATHOL
EXPERIENTIA
FACHLICHE MITT OESTERR TABAKREG
FAINKEMIKARU (FINE CHEM)
FAO AQUACULT BULL
FAO PLANT PROT BULL
FARM CHEM
FARM POL
FARM TECHNOL AGRI-FIELDMAN
FARM ZH (KIEV)
FARMACO (ED SCI)
FARMAKOL TOKSIKOL (MOSCOW)
FARMATSIYA (MOSCOW)
FARUMASHIA (PHARMACY)
FDA (FOOD DRUG ADMIN) PAP
FEBS LETT
FED EUR BIOCHEM SOC LETT
FED PROC FED AMER SOC EXP BIOL
FEL'DSHER AKUSH
FETTE SEIFEN ANSTRICHM
FINE CHEM SEE FAINKEMIKARU
FIRE COMMAND
FISH BULL
FIZIOL AKTIV VESHCHESTVA
FIZIOL BIOKHIM KUL'T RAST
FIZIOL NORM PATOL
FIZIOL RAST
FIZIOL ZH (KIEV)
FLA ENTOMOL
FLEISCHWIRTSCHAFT
FLUORIDE
FOED EUR GEWAESSERSCHUTZ INFORMATIONSBL
FOLIA BIOL (KRAKOW)
FOLIA BIOL (PRAGUE)
FOLIA ENDOCRINOL JAP
  SEE NIPPON NAIBUMPI GAKKAI ZASSHI
FOLIA ENTOMOL MEX
FOLIA MED (NAPLES)
FOLIA MED (PLOVDIV)
FOLIA MED BIALOSTOCENSIA
FOLIA MED CRAKOV
FOLIA MORPHOL (WARSAW)
FOLIA OPHTHALMOL JAP SEE NIPPON GANKA KIYO
FOLIA PHARMACOL JAP SEE NIPPON YAKURIGAKU ZASSHI
FOOD COSMET TOXICOL
FOOD DRUG COSMET LAW J
FOOD NUTR SEE EIYO TO SHOKURYO
FOREIGN COMPOUND METAB MAMMAL
FORENSIC SCI
FOREST CHEM SEE RINGYO TO YAKUZAI
FOREST PHARM SEE RINGYO TO YAKUZAI
FRESENIUS Z ANAL CHEM
FRESHWATER BIOL
FRONTIERS
G IG MED PREV
GA AGR RES
GANKA RINSHO IHO (JAP REV CLIN OPHTHALMOL)
GANN (CANCER)
GARTENBAU
GARTENBAUWISSENSCHAFT
GAS WASSER ABWASSER
GAS WASSER WAERME
GASTROENTEROLOGY
GAS-WASSERFACH WASSER-ABWASSER
GAZ CUKROW
GAZ MED FR
GEKKAN YAKUJI (PHARM MON)
GENETICS
GENETIKA
GEOL SOC AMER BULL
GESUNDE PFLANZ
GESUNDH-ING
GETREIDE MEHL
GEWAESSERSCH WASSER ABWASSER
GIDROBIOL ZH (KIEV)
GIDROTEKH MELIOR
GIG PRIMEN TOKSIKOL PESTITS KLIN OTRAVLENII
GIG SANIT
GIG TR PROF ZABOL
GIT (GLAS-INSTRUM-TECH) FACHZ LAB
GRASAS ACEITES
GROUND WATER
GUMMA-KEN EISEI KENKYUSHO GUMMA-KEN KOGAI KENKYU
  SENTA NENPO (ANNU REP GUMMA PREFECT INST PUR HEALTH CENT
  STUDY ENVIRON POLLUT)
HAKKO KOGAKU ZASSHI (J FERMENT TECHNOL)

HAREFUAH
HARYANA AGR UNIV J RES
HAUTARZT
HEM IND SEE TEHNIKA (BELGRADE)
HERBA POL
HEREDITAS
HEREDITY SEE IDEN
HIDROBIOLOGIA
HIPPOKRATES
HIROSAKI MED J SEE HIROSAKI IGAKU
HIROSHIMA-KEN SHOWA 46 NENDO GYOMU NENPO
  (ANNU REP HIROSHIMA PREFECT)
HISTOCHEMIE
HISTOCHEMISTRY
HOHENHEIMER ARB SCHRIFTEN UNIV HOHENHEIM ALLG REIHE
HOKKAIDORITSU EISEI KENKYUSHO-HO
  (REP HOKKAIDO INST PUB HEALTH)
HOKORIKU BYOGAICHU KENKYU KAIHO
  (PROC SOC PLANT PROT HOKURIKU)
HOKUSUISHI GEPPO (J HOKKAIDO FISH SCI INST)
HOLZ ROH- WERKST
HOPPE-SEYLERS Z PHYSIOL CHEM
HORTSCIENCE
HRANA ISHRANA
HSMHA (HEALTH SERV MENT HEALTH ADMIN) HEALTH REP
HUM BIOL OCEANIA
HUM HYG SEE MINZOKU EISEI
HUMANGENETIK
HWAHAK KWA KONGOP UI CHINBO (PROGR CHEM CHEM IND)
HYDROBIOL J
HYDROBIOLOGIA
HYG SANIT (USSR) (TRANS OF GIG SANIT)
HYOGO-KEN EISEI KENKYUSHO KENKYU HOKOKU
  (BULL HYOGO PREFECT PUB HEALTH LAB)
IDIA (INFORM INVEST AGR)
IEEE TRANS AEROSP ELECT SYST
IG MOD
IGAKU NO AYUMI (PROGR MED)
IGAKU TO SEIBUTSUGAKU (MED BIOL)
IGIENA
IIRB (INST INT RECH BETTERAVIERES)
ILL MED J
ILL NATUR HIST SURV BULL
ILL STATE WATER SURV CIRC
IMMUNOL COMMUN
IN VITRO
IND ALIMENT (BUCHAREST)
IND ALIMENT (PINEROLO ITALY)
IND ALIMENT AGR
IND MED SEE SANGYO IGAKU
IND MED SURG
INDIAN J AGR SCI
INDIAN J ANIM SCI
INDIAN J APPL CHEM
INDIAN J BIOCHEM BIOPHYS
INDIAN J ENTOMOL
INDIAN J ENVIRON HEALTH
INDIAN J EXP BIOL
INDIAN J IND MED
INDIAN J MED RES
INDIAN J MED SCI
INDIAN J PUB HEALTH
INDIAN PEDIAT
INDIAN PHYTOPATHOL
INDIAN SCI CONGR ASS PROC
INDIAN VET J
INDIANA AGR EXP STA INSP REP
INFEC IMMUNITY
INGENIEURSBLAD
INN MED IHRE GRENZGEB
INT ARCH ARBEITSMED
INT BIODETERIOR BULL
INT CHEM ENG
INT CONF TRANSP ENVIR 1 SEL PAP
INT DIG HEALTH LEGIS
INT J BIOCHEM
INT J CANCER
INT J DERMATOL
INT J ENVIRON ANAL CHEM
INT J ENVIRON SCI
INT J ENVIRON STUD
INT J NEUROSCI
INT J PARASITOL
INT PEST CONTR
INT ZOO YEARB
INTERNIST (BERLIN)
INTERVIROLOGY
INVEST PESQ
IOWA STATE UNIV VET
IRYO (MED TREAT)
ISOTOPENPRAXIS
ISR J ENTOMOL
ISR J MED SCI
ITAL VINIC AGR
ITOGI NAUKI TEKH FARMAKOL KHIMIOTER SREDSTVA TOKSIKOL
IUGOSLAV PHYSIOL PHARMACOL ACTA
IZOTOPTECHNIKA
IZV AKAD NAUK SSSR SER BIOL
IZV AKAD NAUK SSSR SER KHIM
IZV INST FIZIOL BULG AKAD NAUK
IZV SEL'SKOKHOZ NAUK
IZV TIMIRYAZEV SEL-SKOKHOZ AKAD
J AGR CHEM SOC JAP SEE NIPPON NOGEI KAGAKU KAISHI
J AGR FOOD CHEM
J AGR SCI
J AGR SCI (TOKYO) SEE NOGYO GIJUTSU (TOKYO)
J AGR UNIV P R
J AIR POLLUT CONTR ASS
J ALA ACAD SCI
J AMER CHEM SOC
J AMER DIET ASS
J AMER MED ASS
J AMER MED WOMEN'S ASS
J AMER SOC CIV ENG
J AMER SOC HORT SCI
J AMER VET MED ASS
J AMER WATER WORKS ASS
J ANIM SCI
J APPL CHEM BIOTECHNOL
J APPL ECOL
J APPL PHYSIOL
J ARKANSAS MED SOC
J ASS OFFIC ANAL CHEM
J ASS PUB ANAL
J AUST ENTOMOL SOC
J BIOCHEM (TOKYO)
J BIOL CHEM
J BIOSOCIAL SCI
J CELL BIOL
J CELL SCI
J CHEM EDUC
J CHROMATOGR
J CHROMATOGR SCI
J CHRONIC DIS
J CLIN ENDOCRINOL METAB
J CLIN NUTR SEE RINSHO EIYO
J COMP PATHOL
J DAIRY SCI
J ECON ENTOMOL
J EGYPT MED ASS
J ELECTRON MICROSC
J ENVIRON HEALTH
J ENVIRON QUAL
J EUR TOXICOL
J EXP BOT
J FERMENT TECHNOL SEE HAKKO KOGAKU ZASSHI
J FISH RES BD CAN
J FLOUR ANIM FEED MILLING
J FOOD HYG SOC JAP SEE SHOKUHIN EISEIGAKU ZASSHI
J FOOD SCI
J FOOD SCI TECHNOL (MYSORE)
  SEE NIPPON SHOKUHIN KOGYO GAKKAI-SHI
J FOREST
J FORMOSAN MED ASS (T'AI-WAN I HSUEH HUI TSA CHIH)
J GA ENTOMOL SOC
J GEN APPL MICROBIOL
J GEN MICROBIOL
J GEN PSYCHOL
J HERED
J HOKKAIDO FISH SCI INST SEE HOKUSUISHI GEPPO
J HYG
J HYG CHEM SEE EISEI KAGAKU

J HYG EPIDEMIOL MICROBIOL IMMUNOL
J INDIAN ACAD FORENSIC SCI
J INDIAN CHEM SOC
J INDIAN MED ASS
J INDIAN SOC SOIL SCI
J INST ENG (CALCUTTA)
J INVEST DERMATOL
J IOWA MED SOC
J IR MED ASS
J JAP ASS RURAL MED SEE NIPPON NOSON IGAKKAI ZASSHI
J JAP ASS THORAC SURG SEE NIPPON KYOBU-GEKA GAKKAI ZASSHI
J JAP BIOCHEM SOC SEE SEIKAGAKU
J JAP ELECTRON MICROSC SOC
SEE NIPPON RINSHO DENSHI KENIKYO GAKKAI-SHI
J JAP INTERN MED SOC SEE NIPPON NAIKA GAKKAI ZASSHI
J JAP MED ASS SEE NIPPON ISHIKAI ZASSHI
J JAP OIL CHEM SOC SEE YUKAGAKU
J JAP OPHTHALMOL SEE NIPPON GANKA KIYO
J JAP OPHTHALMOL SOC SEE NIPPON GANKA GAKKAI ZASSHI
J JAP SOC INTERN MED SEE NIPPON NAIKA GAKKAI ZASSHI
J JAP VET MED SOC SEE NIPPON JUIGAKKAI ZASSHI
J KANS ENTOMOL SOC
J KURUME MED ASS SEE KURUME IGAKKAI ZASSHI
J MAINE MED ASS
J MAR RES
J MAR TECHNOL SOC
J MED ASS GA
J MED ASS STATE ALA
J MED AUST
J MED CHEM
J MED ENTOMOL
J MED SOC N J
J MED SOC TOHO UNIV SEE TOHO IGAKKAI ZASSHI
J MILK FOOD TECHNOL
J N Y ENTOMOL SOC
J NAGOYA CITY UNIV MED ASS
SEE NAGOYA-SHIRITSU DAIGAKU IGAKKAI ZASSHI
J NARA MED ASS SEE NARA IGAKU ZASSHI
J NAT CANCER INST
J NEUROCHEM
J NEUROL NEUROSURG PSYCHIAT
J NIPPON MED SCH SEE NIPPON IKA DAIGAKU ZASSHI
J NUCL MED
J NUTR
J OCCUP MED
J OHIO PUB HEALTH ASS
J OKAYAMA MED SOC SEE OKAYAMA IGAKKAI ZASSHI
J OKLA STATE MED ASS
J OPHTHALMOL SOC JAP SEE NIPPON GANKA GAKKAI ZASSHI
J ORG CHEM
J OSAKA CITY MED CENT
SEE OSAKA SHIRITSU DAIGAKU IGAKU ZASSHI
J PAK MED ASS
J PATHOL
J PEDIAT
J PEDIAT PRACT SEE SHONIKA SHINRYO
J PESTIC SCI SEE NOYAKU KAGAKU
J PHARM PHARMACOL
J PHARM SCI
J PHARMACOL
J PHARMACOL EXP THER
J PHYS E
J PHYSIOL (LONDON)
J PHYSIOL SOC JAP SEE NIPPON SEIRIGAKU ZASSHI
J PRAKT CHEM
J PUB NUISANCE SEE KOGAI TO TAISAKU
J RADIOANAL CHEM
J RANGE MANAGE
J RES PUNJAB AGR UNIV
J RES US GEOL SURV
J ROY AGR SOC ENGL
J ROY COLL PHYSICIANS
J S AFR VET MED ASS
J S C MED ASS
J SANIT ENG DIV AMER SOC CIVIL ENG
J SCI FOOD AGR
J SCI SOIL ANIM FERT JAP
SEE NIPPON DOJO HIRYOGAKU ZASSHI
J SHIKOKU PUB HEALTH SOC SEE SHIKOKU KOSHU EISEIGAKU ZASSHI
J SOC COSMET CHEM
J SOC DAIRY TECHNOL
J SOIL SCI
J STEROID BIOCHEM
J STORED PROD RES
J SURG ONCOL
J TAKEDA RES LAB SEE TAKEDA KENKYUSHO HO
J TENN MED ASS
J THER SEE CHIRYO
J THERM ANAL
J TROP MED HYG
J URBAN LIVING HEALTH ASS SEE SEIKATSU EISEI
J WASH ACAD SCI
J WATER POLLUT CONTR FED
J WILDL MANAGE
J ZOO ANIM MED
J ZOOL
JAP AGR RES QUART SEE JARQ
JAP ANAL SEE BUNSEKI KAGAKU
JAP J AGR SCI SEE NOGYO GIJUTSU
JAP J APPL ENTOMOL ZOOL
SEE NIPPON OYO DOBUTSU KONCHU GAKKAI-SHI
JAP J CLIN MED SEE NIPPON RINSHO
JAP J CLIN OPHTHALMOL SEE RINSHO GANKA
JAP J CLIN PATHOL SEE RINSHO BYORI
JAP J ENDOCRINOL
SEE NIPPON NAIBUMPI GAKKAI ZASSHI
JAP J HYG SEE NIPPON EISEIGAKU ZASSHI
JAP J IND HEALTH SEE SANGYO IGAKU
JAP J IND HYG SEE RODO EISEI
JAP J LEG MED SEE NIPPON HOIGAKU ZASSHI
JAP J OPHTHALMOL SEE NIPPON GANKA KIYO
JAP J OPHTHALMOL SOC SEE NIPPON GANKA GAKKAI ZASSHI
JAP J PHARMACOL SEE NIPPON YAKURIGAKU ZASSHI
JAP J PUB HEALTH SEE NIPPON KOSHU EISEI ZASSHI
JAP J THORAC DIS SEE NIPPON KYOBUSHIKKAN GAKKAI ZASSHI
JAP J VET SCI SEE NIPPON JUIGAKU ZASSHI
JAP J ZOOTECH SCI SEE NIPPON CHIKUSAN GAKKAI-HO
JAP MED J SEE NIPPON IJI SHINPO
JAP PESTIC INFORM
JAP PLANT PROTECT SEE SHOKUBUTSU BOEKI
JAP RADIOISOTOPE ASS NEWS
SEE NIPPON HOSHASEI DOIGENSO KYOKAI NYUSU
JAP REV CLIN OPHTHALMOL SEE GANKA RINSHO IHO
JARQ (JAP AGR RES QUART)
JNKVV RES J (JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA)
JOHNS HOPKINS MED J
JORNADAS ARGENT TOXICOL ANAL ACTAS
JUGOSLOV INOST DOK ZAST RADU
KAGAKU (TOKYO) (SCIENCE)
KAGAKU KEISATSU KENKYUSHO HOKOKU
(REP NAT RES INST POLICE SCI)
KAGAKU KOGYO (CHEM IND (TOKYO))
KAGAKU TO KOGYO (OSAKA) (CHEM CHEM IND) (OSAKA)
KAGAKU TO KOGYO (TOKYO) (CHEM CHEM IND) (TOKYO)
KAGAKU TO SEIBUTSU (CHEM BIOL)
KAGAWA-KEN NOGYO SHIKENJO KENKYU HOKOKU
(BULL KAGAWA PREFECT AGR EXP STA)
KANAGAWA-KEN EISEI KENKYUSHO NENPO
(ANNU REP KANAGAWA PREFECT PUB HEALTH LAB)
KANGYO SOZO (ENVIRON CREATION)
KANSAI BYOCHUGAI KENKUKAI-HO (PROC KANSAI PLANT PROTECT SOC)
KANTO TOSAN BYOGAICHU KENKYUKAI NENPO
(PROC KANTO TOSAN PLANT PROTECT SOC)
KARUTE (CASE HIST)
KEM IND
KERTESZETIEGYETEM KOZLEM
KHARCHOVA PROM
KHIG ZDRAVEOPAZVANE
KHIM IND (SOFIA)
KHIM SEL KHOZ
KIEL MILCHWIRT FORSCHUNGSBER
KISERL ORVOSTUD
KITAKANTO IGAKU (KITAKANTO MED J)
KITAKANTO MED J SEE KITAKANTO IGAKU
KLIN WOCHENSCHR
KOGAI TO TAISAKU (J PUB NUISANCE)
KONGETSU NO NOYAKU (AGR CHEM MON)
KONSERV OVOSHCHESUSH PROM
KOSHU EISEI JOHO (PUB HEALTH INFORM)
KOSMOS (STOCKHOLM)
KOSMOS (WARSAW) SER A

KUMAMOTO-KEN EISEI KENKYU SHOHO
(ANNU REP KUMAMOTO PREFECT INST PUB HEALTH)
KURUME IGAKKAI ZASSHI (J KURUME MED ASS)
LA AGR
LAB ANIM
LAB ANIM SCI
LAB DELO
LAB INVEST
LABDEV PART B
LAIT
LANCET
LANDBOUWK TIJDSCHR
LANDTECHNIK
LANDWIRTSCH FORSCH
LANTBRUKSHOEGSK MEDD SER A
LATV PSR ZINAT AKAD VESTIS
LAV UM
LEK OBZ
LIFE SCI PART 1
LIFE SCI PART II
LIPIDS
MAATALOUSTIETEELLINEN AIKAK
MACDONALD J
MADRAS AGR J
MAGY ALLATORV LAPJA
MANITOBA ENTOMOL
MAR BIOL
MAR POLLUT BULL
MARSEILLE MED
MATER BADAW
MED ANN D C
MED BIOL
MED BIOL SEE IGAKU TO SEIBUTSUGAKU
MED CLIN N AMER
MED COUNTERPOINT
MED ESPAN
MED J AUST
MED KLIN (MUNICH)
MED LAV
MED MONATSSCHR
MED PARAZITOL PARAZIT BOLEZ
MED PRACY
MED REP NAKADORI HOSP
MED SCI LAW
MED TIMES (PORT WASH N Y)
MED TREAT SEE IRYO
MED TRIAL TECH QUART
MED WELT
MED WET
MED WIEJSK
MED WORLD NEWS
MED ZH UZB
MEDED FAC LANDBOUWWETENSCH RIJKSUNIV GENT
MEDICAMENTA
MEDICINA (BUENOS AIRES)
MELD NORG LANDBRUKSHOEGSK
METALS MINER REV
MFG CHEM AEROSOL NEWS
MICH ACAD
MICROCHEM J
MIE IGAKU (MIE MED SCI)
MIE-KEN EISEI KENKYUSHO NENPO
(ANNU REP MIE PREFECT INST PUB HEALTH)
MIE MED SCI SEE MIE IGAKU
MIKROBIOL ZH (KIEV)
MIKROCHIM ACTA (WIEN)
MILCH BER BUND WOLFPASS ROTH
MILCHWISSENSCHAFT
MINERVA MED
MINING ENG (N Y)
MINN MED
MINN UNIV AGR EXT SERV BULL
MINZOKU EISEI (HUM HYG)
MISS AGR FOREST EXP STA
MISS FARM RES
MITT BIOL BUNDESANST LAND-FORSTWIRT BERLIN-DAHLEM
MITT CHEM FORSCHUNGSINST WIRT OESTERR OESTERR KUNSTSTOFF INST
MITT DEUT PHARM GES
MITT GEB LEBENSMITTELUNTERS HYG
MITTEILUNGSBL GDCH (GES DEUT CHEM)
FACHGRUPPE LEBENSMITTELCHEM GERICHTL CHEM
MLJEKARSTVO
MO MED
MOD KEMI
MOD VET PRACT
MOL GEN GENET
MOL PHARMACOL
MOL PHYS
MOLOCH PROM
MONATSH VETERINAERMED
MONATSSCHR KINDERHEILK
MONATSSCHR OHRENHEILK LARYNGO-RHINOL
MOSQUITO NEWS
MUENCHEN BEITR ABWASSER-FISCH-FLUSSBIOL
MUENCHEN MED WOCHENSCHR
MUTAT RES
MYCOPATHOL MYCOL APPL
N ENGL J MED
N Y STATE ASS MILK FOOD SANIT ANNU REP
N Z J AGR
N Z J AGR RES
N Z J EXP AGR
N Z J MAR FRESHWATER RES
N Z J SCI
N Z MED J
N Z VET J
NACHRICHTENBL DEUT PFLANZENSCHUTZDIENSTES
NACHRICHTENBL PFLANZENSCHUTZDIENST DDR
NAGASAKI-KEN EISEI KENKYU NENPO
(ANNU REP NAGASAKI PREFECT HYG LAB)
NAGOYA MED J
NAGOYA-SHI EISEI KENKYU SHOHO
(REP NAGOYA MUNIC PUB HEALTH LAB)
NAGOYA-SHIRITSU DAIGAKU IGAKKAI ZASSHI
(J NAGOYA CITY UNIV MED ASS)
NAHRUNG
NAIKA (INTERN MED)
NARA IGAKU ZASSHI (J NARA MED ASS)
NARA-KEN EISEI KENKYU SHOHO
(ANNU REP NARA PREFECT INST PUB HEALTH)
NASA TECH TRANSL
NAT CLGH POISON CONTROL CENT BULL
NAT DEF MED J SEE BOEI EISEI
NAT FISHERMAN
NAT PEST CONTR OPER NEWS
NAT WOOL GROWER
NATUR HIST
NATURE (LONDON)
NATURWISS RUNDSCH
NATURWISSENSCHAFTEN
NAUCH TR VISSH MED INST
NAUCH TR VISSH PEDAGOG INST PLOVDIV MAT FIZ KHIM BIOL
NAUNYN-SCHMIEDEBERGS ARCH PHARMAKOL
NAVAL RES
NED TIJDSCHR GENEESKD
NEHEZVEGYIP KUT INTEZ KOZLEM
NEMATOLOGICA
NEPHRON
NETH J AGR SCI
NETH J PLANT PATHOL
NETH MIN SOC AFF DIR GEN
NEUROL PSIHIAT NEUROCHIR
NEUROLOGY
NEUROPATOL POL
NEUROPHARMACOLOGY
NEW SCI
NEWSLETT ENVIRON MUTAGEN SOC
NIIGATA IGAKKAI ZASSHI (NIIGATA MED J)
NIIGATA MED J SEE NIIGATA IGAKKAI ZASSHI
NIPPON BYORI GAKKAI KAISHI (TRANS SOC PATHOL JAP)
NIPPON CHIKUSAN GAKKAI-HO (JAP J ZOOTECH SCI)
NIPPON DOJO-HIRYOGAKU ZASSHI (J SCI SOIL ANIM FERT JAP)
NIPPON EISEIGAKU ZASSHI (JAP J HYG)
NIPPON GANGAKKAI KIJI (PROC JAP CANCER ASS)
NIPPON GANKA GAKKAI ZASSHI (J JAP OPHTHALMOL SOC)
NIPPON GANKA KIYO (J JAP OPHTHALMOL)
NIPPON HOIGAKU ZASSHI (JAP J LEG MED)
NIPPON HOSHASEI DOIGENSO KYOKAI NYUSU
(JAP RADIOISOTOPE ASS NEWS)
NIPPON IJI SHINPO (JAP MED J)
NIPPON IKA DAIGAKU ZASSHI (J NIPPON MED SCH)
NIPPON ISHIKAI ZASSHI (J JAP MED ASS)

NIPPON JUIGAKU ZASSHI (JAP J VET SCI)
NIPPON KAGAKU RYOHOGAKUKAI ZASSHI
(CHEMOTHERAPY (TOKYO))
NIPPON KINGAKKAI KAIHO (TRANS MYCOL SOC JAP)
NIPPON KOGYO EISEI GAKKAI NENKAI HOKOKU
(PROC JAP IND HYG SOC ANNU MEET)
NIPPON KOSHU EISEI ZASSHI (JAP J PUB HEALTH)
NIPPON KYOBU-GEKA GAKKAI ZASSHI
(J JAP ASS THORAC SURG)
NIPPON KYOBU SHIKKAN GAKKAI ZASSHI (JAP J THORAC DIS)
NIPPON NAIBUMPI GAKKAI ZASSHI (JAP J ENDOCRINOL)
NIPPON NAIKA GAKKAI ZASSHI (J JAP SOC INTERN MED)
NIPPON NOGEI KAGAKU KAISHI (J AGR CHEM SOC JAP)
NIPPON NOSON IGAKKAI ZASSHI (J JAP ASS RURAL MED)
NIPPON OYO DOBUTSU KONCHU GAKKAI-SHI
(JAP J APPL ENTOMOL ZOOL)
NIPPON RINSHO (JAP CLIN MED)
NIPPON RINSHO DENSHI KENBIKYO GAKKAI-SHI
(J JAP ELECTRON MICROSC SOC)
NIPPON SANGYO EISEI GAKKAI KOENSHU
(PROC JAP IND HYG SOC ANNU MEET)
NIPPON SEIRIGAKU ZASSHI (J PHYSIOL SOC JAP)
NIPPON SUISAN GAKKAI-SHI (BULL JAP SOC SCI FISH)
NIPPON YAKURIGAKU ZASSHI (JAP J PHARMACOL)
NOGYO GIJUTSU (TOKYO) (J AGR SCI (TOKYO))
NOGYO OYOBI ENGEI (AGR HORT)
NOHA TO KINDENZU (ELECTROENCEPHALOGR ELECTROMYOGR)
NOR VET-TIDSSKR
NORD HYG TIDSKR
NORD VET MED
NOUV PRESSE MED
NOYAKU BIJINESU (PESTIC BUSINESS)
NOYAKU KAGAKU (J PESTIC SCI)
NOYAKU KENSASHO HOKOKU SEE BULL AGR CHEM INSP STA
NOYAKU SEISAN GIJUTSU (PESTIC TECH)
NUOVI ANN IG MICROBIOL
NURS TIMES
NUTR REP INT
OBSTET GYNECOL
OCCUP DIS CALIF ATTR PESTIC AGR CHEM
OECD AGR REV
OECOL PLANT
OEFF GESUNDHEITSW
OHIO AGR RES DEVELOP CENT RES CIRC
OHIO J SCI
OIKOS
OKAYAMA IGAKKAI ZASSHI (J OKAYAMA MED SOC)
OKAYAMA-KEN EISEI KENKYUSHO NENPO
(ANNU REP OKAYAMA PREFECT PUB HEALTH LAB)
OLEAGINEUX
ONDERSTEPOORT J VET RES
ONKOLOGIYA (KIEV)
OPHTHALMOLOGY SEE GANKA
ORG CHEM SOIL ENVIRON
ORG MASS SPECTROM
ORNITHOL BEOB
ORV HETIL
OSAKA SHIRITSU DAIGAKU IGAKU ZASSHI
(J OSAKA CITY MED CENT)
OSAKA SHIRITSU EISEI KENKYUSHO KENKYU HOKOKU
(REP OSAKA MUNIC INST PUB HEALTH)
OUTLOOK AGR
OYO-YAKURI (PHARMACOMETRICS)
PA MED
PACIFIC SCI
PAEDIATRICIAN
PAK J SCI IND RES
PAK J SCI RES
PAMIET PULAWSKI
PAN AMER HEALTH ORGAN SCI PUB
PAPUA NEW GUINEA AGR J
PATOL FIZIOL EKSP TER
PATOL POL
PEDIAT CLIN N AMER
PEDIAT POL
PEDIATRICS
PEDIATRICS (TOKYO) SEE SHONIKA
PEDIATRIYA (MOSCOW)
PEDOBIOLOGIA
PEDOLOGIE
PEST CONTR
PESTIC BIOCHEM PHYSIOL
PESTIC BUSINESS SEE NOYAKU BIJINESU
PESTIC MONIT J
PESTIC PEST
PESTIC SCI
PESTIC TECH SEE NOYAKU SEISAN GIJUTSU
PESTICIDES
PESTICIDES (TOKYO) SEE NOYAKU
PFLANZENARZT
PFLANZENSCHUTZ-NACHR
PFLUEGERS ARCH
PHARM GAZ SEE YAKUMU KOHO
PHARM MON SEE GEKKAN YAKUJI
PHARM PRAX
PHARM UNSERER ZEIT
PHARMACOL BIOCHEM BEHAV
PHARMACOL RES COMMUN
PHARMACOLOGIST
PHARMACOLOGY
PHARMACOMETRICS SEE OYO YAKURI
PHARMACY SEE FARMUASHIA
PHARMAZIE
PHYCOLOGIA
PHYSIOL BEHAV
PHYSIOL BOHEMOSLOV
PHYSIOL PLANT
PHYSIOLOGIST
PHYTIAT-PHYTOPHARM
PHYTOCHEMISTRY
PHYTOMA
PHYTOPATHOL Z
PHYTOPATHOLOGY
PHYTOPHYLACTICA
PHYTOPROTECTION
PLANT BULL
PLANT PHYSIOL
PLANT PROTECT SEE SHOKUBUTSU BOEKI
PLANT SOIL
PLANTA MED
POCHVOVED AGROKHIM
POCHVOVIDENIE
POL ARCH HYDROBIOL
POL ARCH WET
POL PHARMACOL PHARM
POL PISMO ENTOMOL
POL TYG LEK
POL'NOHOSPODARSTVO
POSTEPY HIG MED DOSW
POSTEPY MIKROBIOL
POSTEPY NAUK ROLN
POSTGRAD MED J
POULTRY SCI
POUMON COEUR
POZNAN TOW PRZYJ NAUK PR KOM
PPM
PR CENT INST OCHR PR
PR INST LAB BADAW PRZEM SPOZYW
PR INST PRZEM ORG
PR NAUK INST OCHR ROSL
PRAC LEK
PRACTITIONER
PRAKT TIERARZT
PRAXIS
PRESSE MED
PRESSE THERM CLIM
PRIRODA (MOSCOW)
PROBL ANAL KHIM
PROBL ENDOKRINOL (MOSCOW)
PROC AGR PRACT WATER QUAL
PROC AMER ASS CANCER RES
PROC ANNU CALIF WEED CONF
PROC ANNU CONF SOUTHEAST ASS GAME FISH COMM
PROC ANNU MEET N J MOSQ EXTERM ASS
PROC ANNU TALL TIMBERS FIRE ECOL CONF
PROC ARKANSAS ACAD SCI
PROC ASS INT LIMNOL THEOR
PROC AUST BIOCHEM SOC
PROC BIODETERIOR MATER
PROC BRIT PEST CONTR CONF
PROC CAN FED BIOL SOC
PROC CONF GT LAKES RES

PROC CONF POLLUT NAVAL WATER PEARL HARBOR
PROC ENTOMOL SOC ONT
PROC 1ST EUR BIOPHYS CONGR
PROC GULF COAST CONF MOSQ
PROC HAWAII ENTOMOL SOC 1970
PROC INDIANA ACAD SCI
PROC INST ENVIRON SCI ANNU TECH MEET
PROC INT CONF ADVAN WATER POLLUT
PROC INT SYMP RADIOECOL APPL PR
PROC IOWA ACAD SCI
PROC JAP CANCER ASS SEE NIPPON GANGAKKAI KIJI
PROC KANSAI PLANT PROTECT SOC
  SEE KANSAI BYOCHUGAI KENKUKAI-HO
PROC KANTO TOSAN PLANT PROTECT SOC
  SEE KANTO TOSAN BYOGAICHU KENKYUKAI NENPO
PROC MEAT IND RES CONF
PROC N Z WEED PEST CONTR CONF
PROC NAT ACAD SCI INDIA
PROC NAT ACAD SCI USA
PROC NAT CONF PROT CLOTHING SAF EQUIP PESTIC WORK
PROC NORTHEAST WEED SCI SOC
PROC PA ACAD SCI
PROC ROY AUST CHEM INST
PROC ROY SOC EDINBURGH B
PROC ROY SOC MED
PROC S D ACAD SCI
PROC S WEED SCI SOC
PROC SEMIN ENVIRON ECOL PESTIC
PROC SOC ANAL CHEM
PROC SOC EXP BIOL MED
PROC SOC PLANT PROTECT HOKURIKU
  SEE HOKORIKU BYOGAICHU KENKYU KAIHO
PROC TRANS RHODESIA SCI ASS
PROC UNIV OTAGO MED SCH
PROC UTAH MOSQ ABATEMENT ASS
PROC WEST PHARMACOL SOC
PROC WEST SOC WEED SCI
PROCESS CHEM ENG
PROD PROBL PHARM
PROGR AGR ARIZONA
PROGR BIOCHEM PHARMACOL
PROGR BRAIN RES
PROGR CHEM CHEM IND SEE HWAHAK KWA KONGOP UI CHINBO
PROGR CHEM FATS OTHER LIPIDS
PROGR EXP TUMOR RES
PROGR FISH CULTURIST
PROGR MED SEE IGAKU NO AYUMI
PROM ARM
PROMPT REP STUD TOKYO METROP AGR EXP STA
  SEE TOKYO-TO NOGYO SHIKENJO KENKYU SOKUHO
PROTECT VITAE
PROTOPLASMA
PRUM POTRAVIN
PRZEM SPOZYW
PSYCHOPHARMACOLOGIA
PSZCZELNICZE ZESZ NAUK
PUB HEALTH
PUB HEALTH INFORM SEE KOSHU EISEI JOHO
PUB HEALTH LAB
PURDUE UNIV AGR EXP STA RES BULL
PYRETHRUM POST
QUAD SCLAVO DIAGN CLIN LAB
QUAL PLANT MATER VEG
QUAL PLANT PLANT FOODS HUM NUTR
QUART J FOREST
QUART MED REV
RADIOCHEM RADIOANAL LETT
RADIOLOGY
RALATA TECH CHIM BIOL APPL
RASS CHIM
RAST ZASHT
RECHERCHE
RECL MED VET
REFUAH VET
REP AKITA PREFECT INST PUB HEALTH
  SEE AKITA-KEN EISEI KAGAKU KENKYU SHOHO
REP EHIME PREFECT HYG LAB
  SEE EHIME-KENRITSU EISEI KENKYUSHO-HO
REP GOVT CHEMIST 1970
REP HOKKAIDO INST PUB HEALTH
  SEE HOKKAIDORITSU EISEI KENKYU SHOHO
REP NAGOYA MUNIC PUB HEALTH LAB
  SEE NAGOYA-SHI EISEI KENKYU SHOHO
REP NAT INST POLICE SCI
  SEE KAGAKU KEISATSU KENKYUSHO HOKOKU
REP ONTARIO DEPT ENVIRON
REP OSAKA MUNIC INST PUB HEALTH
  SEE OSAKA SHIRITSU EISEI KENKYUSHO KENKYU HOKOKU
REP TOKYO PUB HEALTH STUD
  SEE TOKYO-TO EISEI-KYOKU GAKKAI-SHI
REP TOTTORI PREFECT HYG RES INST
  SEE TOTTORI-KEN EISEI KENKYUSHO-HO
REP USE POISON SUBSTANCES AGR
RES COMMUN CHEM PATHOL PHARMACOL
RES EXP MED
RES IND
RES LIFE SCI
RES VET SCI
RESIDUE REV
RESUSCITATION
REV ACAD CIENCIAS
REV AGROQUIM TECNOL ALIMENT
REV ASOC BIOQUIM ARGENT
REV BIOL (LISBON)
REV BRASIL FARM
REV CHIL PEDIAT
REV CHIM (BUCHAREST)
REV COLOMB CIENC QUIM
REV ECOL BIOL SOL
REV FAC CIENC AGR UNIV NAC CUYO
REV FAC FARM ODONTOL ARARAQUARA
REV FARM BIOQUIM UNIV SAO PAULO
REV INST ADOLFO LUTZ
REV LAIT FR
REV MED (TIRGU-MURES)
REV MED CHILE
REV MED-CHIR
REV MED VET (TOULOUSE)
REV PADURILOR
REV PATHOL COMP MED EXP
REV PERU ENTOMOL
REV ROUM BIOCHIM
REV ROUM EMBRYOL
REV ROUM NEUROL
REV SANID HIG PUB
REV VET VENEZ
REV ZOOTEH MED VET
RHOD J AGR RES
RHOD SCI NEWS
R I MED J
RICE J
RINGYO SHIKENJO KENKYU HOKOKU (BULL GOV FOREST EXP STA)
RINGYO TO YAKUZAI (FOREST PHARM)
RINSHO BYORI (JAP J CLIN PATHOL)
RINSHO EIYO (J CLIN NUTR)
RINSHO GANKA (JAP J CLIN OPHTHALMOL)
RINSHO NOHA (CLIN ELECTROENCEPHAL)
RINSHO SHINKEIGAKU (CLIN NEUROL)
RIV INFORT MAL PROF
RIV ITAL SOSTANZE GRASSE
RIV VITICOLT ENOL
ROCKY MT MED J
ROCZ GLEBOZN
ROCZ PANSTW ZAKL HIG
ROCZ POMORSKIEJ AKAD MED SZCZECINIE
RODO EISEI (JAP J IND HYG)
ROM MED REV
ROY SOC HEALTH J
RUSS PHARMACOL TOXICOL
  TRANS OF FARMAKOL TOXICOL (MOSCOW)
RYB KHOZ
S AFR J LAB CLIN MED
S AFR MED J
S AFR SUGAR J
S DAK BIRD NOTES
SAIBOKAKU BYORIGAKU ZASSHI (ARCH HISTOL)
SAKH PROM
SANGYO IGAKU (IND MED)
SANKYO KENKYUSHO NENPO (ANNU REP SANKYO RES LAB)
SB NAUCH TR DONSKOI SEL:SKOKHOZ INST
SB RAB LENINGRAD VET INST
SB TR SUD MED SUD KHIM MATER SOVESHCH

SB VED PR VYZ SK CHEMICKOTECHNOL PARDUBICE
SB VYS SK CHEM-TECHNOL PRAZE CHEM TECHNOL SILIKATU
SCAND J RESP DIS
SCHRIFTENR VER WASSER-BODEN-LUFTHYG BERLIN-DAHLEM
SCHWEIZ ARCH TIERHEILK
SCHWEIZ Z FORSTWES
SCI AGR BOHEMOSLOV
SCI ALIMENT
SCI AMER
SCI FOODS SEE SHOKURYO NO KAGAKU
SCI NEWS
SCI PEST CONTR SEE BOCHU KAGAKU
SCI PROGR DECOUVERTE
SCI REP HIROSAKI UNIV
SCI TOOLS
SCI TOTAL ENVIRON
SCIENCE
SCIENCE (TOKYO) SEE KAG KU (TOKYO)
SCIENCES
SCR MED FAC MED UNIV BRUN PURKY
SEA SECRETS
SEARCH
SEIKAGAKU (J JAP BIOCHEM SOC)
SEIKATSU EISEI (J URBAN LIVING HEALTH ASS)
SEL'SKOKHOZ BIOL
SELSKOSTOP NAUKA
SEM HOP
SEM MED
SENRYO TO YAKUHIN (DYEST CHEM)
SENTEN IJO (CONGENITAL ANOMALIES)
SHIKOKU KOSHU EISEIGAKU ZASSHI (J SHIKOKU PUB HEALTH SOC)
SHIMANE-KEN EISEI KENKYUSHO NENPO
(ANNU REP SHIMANE PREFECT INST PUB HEALTH)
SHOKUBUTSU BOEKI (PLANT PROTECT)
SHOKUBUTSU NO KAGAKU CHOSETSU (CHEM REGUL PLANTS)
SHOKUHIN EISEIGAKU ZASSHI (J FOOD HYG SOC JAP)
SHOKURYO NO KAGAKU (SCI FOODS)
SHONIKA (PEDIATRICS (TOKYO))
SHONIKA SHINRYO (J PEDIAT PRACT)
SOAP COSMET CHEM SPEC
SOC APPL BACTERIOL SYMP SER
SOGO RINSHO (CLIN ALL-AROUND)
SOIL BIOCHEM
SOIL BIOL BIOCHEM
SOIL CROP SCI SOC FLA
SOIL SCI
SOIL SCI PLANT NUTR (TOKYO)
SOIL SCI SOC AMER PROC
SOOBSHCH AKAD NAUK GRUZ SSR
SOUTH MED J
SOUTHWEST VET
SOV GENET (TRANS OF GENETIKA)
SOV MED
SOV SOIL SCI
SOV ZDRAVOOKHR KIRG
SPAN (LONDON)
SPECTROSC LETT
SRP ARH CELOK LEK
STAEDTEHYGIENE
STAUB
STOMATOLOGIYA (MOSCOW)
STOMATOLOGIYA (SOFIA)
STRAHLENTHERAPIE
STUD BIOPHYS
STUD CERCET BIOL SER ZOOL
STUD CERCET CHIM
SUD-MED EKSPERT
SUESSWAREN
SULZER TECH REV
SUNDHEDSSTYRELSEN
SUVREM MED
SV FARM TIDSKR
SYMP BIOL HUNG
T'AI-WAN I HSUEH HUI TSA CHIH
SEE J FORMOSAN MED ASS
TAIWANIA
TAKEDA KENKYUSHO HO (J TAKEDA RES LAB)
TALANTA
TAXON
TECH LAIT
TECH SCI
TECHNOL REV
TENN FARM HOME SCI PROGR REP
TERATOLOGY
TETHYS
TETRAHEDRON
TETRAHEDRON LETT
TEX J SCI
TEX WATER DEVELOP BD REP
THEOR APPL GENET
THER GEGENW
THERAPIE
TIDSSKR KJEMI BERGV MET
TIDSSKR PLANTEAVL
TIERAERZTL UMSCH
TIJDSCHR DIERGENEESK
TIJDSCHR SOC GENEESK
TLUSZCZE JADALNE
TNO NIEUWS
TOB HEALTH WORKSHOP CONF PROC
TOB INT SEE TOB SCI
TOB SCI
TOHO IGAKKAI ZASSHI (J MED SOC TOHO UNIV)
TOHOKU J EXP MED
TOKYO-TO EISEI-KYOKU GAKKAI-SHI
(REP TOKYO PUB HEALTH STUD)
TOKYO-TO NOGYO SHIKENJO KENKYU SOKUHO
(PROMPT REP STUD TOKYO METROP AGR EXP STA)
TOKYO-TORITSU EISEI KENKYUSHO KENKYU NENPO
(ANNU REP TOKYO METROP RES LAB PUB HEALTH)
TOTTORI-KEN EISEI KENKYUSHO-HO
(REP TOTTORI PREFECT HYG RES INST)
TOXICOL APPL PHARMACOL
TOXICOLOGY
TR KAZ NAUCH-ISSLED VET INST
TR MOLD NAUCH-ISSLED INST ZHIVOTNOVOD VET
TR UZB NAUCH-ISSLED INST VET
TR VSES INST VET SANIT
TR VSES NAUCH-ISSLED INST VET
TRANS AMER FISH SOC
TRANS ASAE (AMER SOC AGR ENG)
TRANS ILL STATE ACAD SCI REP
TRANS MYCOL SOC JAP SEE NIPPON KINGAKKAI KAIHO
TRANS ROY SOC TROP MED HYG
TRANS SOC OCCUP MED
TRANS SOC PATHOL JAP
SEE NIPPON BYORI GAKKAI KAISHI
TRANS ST JOHN'S HOSP DERM SOC
TRAV SOC PHAR MONTPELLIER
TRIANGLE
TRIB CEBEDEAU
TROP GEOGR MED
TROP MED
TSITOL GENET
TSITOLOGIYA
TUMORI
UCH ZAP KAZAN VET INST
UCH ZAP PETROZAVODSK GOS UNIV
UGESKR LAEGER
UKR BIOKHIM ZH
UKR KHIM ZH
ULSTER MED J
UMSCHAU
UMWELT
UNIV WASH PUBL FISH NEW SER
UZB BIOL ZH
UZB KHIM ZH
VA J SCI
VA MED MON
VA POLYTECH INST WATER RESOUR RES
VAEXTSKYDDSNOTISER
VAR FOEDA
VERH DEUT GES INN MED
VERN OG VELFERD
VESTN AKAD MED NAUK SSSR
VESTN DERMATOL VENEROL
VESTN OFTALMOL
VESTN OTORINOLARINGOL
VESTN SEL'SKOKHOZ NAUKI (MOSCOW)
VESTN ZOOL
VESTSI AKAD NAVUK BELARUS SER SEL'SKAGASPAD NAVUK
VET ARH

VET CAS
VET CLIN N AMER
VET GLASN
VET ITAL
VET MED
VET-MED NAUKI
VET MED SMALL ANIM CLIN
VET REC
VET SBIRKA
VETERINARIA (SARAJEVO)
VETERINARIYA (MOSCOW)
VIRCHOWS ARCH A
VISION RES
VISS SELSKOSTOP INST V KOLAROV
VOD HOSPOD B
VOEDING
VOEDINGSMIDDELENTECHNOLOGIE
VOENNO-MED ZH
VOJNOSANIT PREGL
VOM WASSER
VOP MED KHIM
VOP ONKOL
VOP PITAN
VRACH DELO
WAKAYAMA-KEN EISEI KENKYUSHO NENPO
(ANNU REP WAKAYAMA PREFECT INST PUB HEALTH)
WASSER BODEN
WASSERWIRT-WASSERTECH
WATER AIR SOIL POLLUT
WATER POLLUT CONTR
WATER RES
WATER RESOUR BULL
WATER SEWAGE WORKS
WATER TREAT TECHNOL SEE MIZU SHORI GIJUTSU
WATER WASTE SEE YOSUI TO HAISUI
WEED CONTR SEE ZASSO TO SONO BOJO
WEED RES
WEED RES (TOKYO) SEE ZASSO KENKYU
WEED SCI
WEST INDIAN MED J
WHO CHRONICLE
WHO TECH REP SER
WIAD CHEM
WIAD LEK
WIAD PARAZYTOL
WIEN KLIN WOCHENSCHR
WIEN MED WOCHENSCHR
WIEN TIERAERZTL MONATSSCHR
WIS DEP AGR BULL
WISS BEITR MARTIN-LUTHER UNIV HALLE-WITTENBERG
WISS Z TECH UNIV DRESDEN
WORK ENVIRON HEALTH
WORLD FARMING
WORLD HEALTH ORGAN TECH REP SER
WORLD MED J
WORLD REV NUTR DIET
XENOBIOTICA
YAKUMU KOHO (PHARM GAZ)
YAMAGUCHI-KEN EISEI KENKYUSHO KENPO
(ANNU REP YAMAGUCHI PREFECT RES INST HEALTH)
YAMAGUCHI SANGYO IGAKU (ANNU REP YAMAGUCHI SOC IND HEALTH)
YAMANASHI KENRITSU EISEI KENKYUSHO NENPO
(ANNU REP YAMANASHI PREFECT INST PUB HEALTH)
YOSUI TO HAISUI (WATER WASTE)
YUKAGAKU (J JAP OIL CHEM SOC)
Z AERZTL FORTBILD
Z ALLGEMEINMED
Z ANGEW ENTOMOL
Z ANGEW ZOOL
Z CHEM
Z GESAMTE HYG
Z GESAMTE INN MED IHRE GRENZ
Z KREBSFORSCH
Z KULTURTECH FLURBEREINIG
Z LEBENSM-UNTERS-FORSCH
Z MED LABORTECH
Z MIKROSK-ANAT FORSCH
Z NATURFORSCH
Z NEUROL
Z PFLANZENERNAEHR
Z PFLANZENKR PFLANZENSCHUTZ
Z RECHTSMED
Z WASSER ABWASSER FORSCH
ZAP LENINGRAD SEL'SKOKHOZ INST
ZASHCH RAST (KIEV)
ZASHCH RAST (MOSCOW)
ZASSO KENKYU (WEED RES (TOKYO))
ZASSO TO SONO BOJO (WEED CONTR)
ZAST BILJA
ZAST MATER
ZAVOD LAB
ZDRAVOOKHR KAZ
ZDRAVOOKHR TADZH
ZDRAVOOKHR TURKM
ZDRAVOOKHRANENIE
ZENTRALBL ALLG PATHOL PATHOL ANAT
ZENTRALBL ARBEITSMED ARBEITSSCH
ZENTRALBL BAKTERIOL PARASITENK INFEKTIONSKR HYG ART 1
ZENTRALBL VETERINAERMED REIHE A
ZESK NAUK AKAD ROLN SZCZELINIE
ZESZ NAUK WYZSZ SZK ROLN OLSZTYNIE
ZESZ NAUK WYZSZ SZK ROLN WROCLAW
ZH ANAL KHIM
ZH EKSP KLIN MED
ZH MIKROBIOL EPIDEMIOL IMMUNOBIOL
ZH NEVROPATOL PSIKHIAT IM S S KORSAKOVA
ZH PRIKL KHIM (LENINGRAD)
ZH USHN NOS GORL BOLEZ
ZH VSES KHIM OBSHCHEST
ZHIVOTNOVODSTVO
ZIVOCISNA VYROBA
ZOOL ZH
ZOOPROFILASSI
ZUCKER

75-0001. Chiang, H. C. (Dept. Entomol., Fisheries Wildlife, Univ., Minnesota, St. Paul, MN). **Ecological considerations in developing recommendations for chemical control of pests: European corn borer as a model.** *FAO Plant Prot. Bull. 21(2): 30-39; 1973.* (18 references)

A recommendation for the chemical control of an insect pest serves as the guideline for determining whether or not treatment is needed and if so, the proper timing of the procedure to be used. This guideline is designed to produce maximum effects on the target species while minimizing unwanted side effects. The development of a recommendation involves consideration of economic, technical, and ecological factors. Necessary ecological analyses would include: pest-crop damage relationships; population dynamics of the pest; seasonal history and feeding habits of the pest; and operational efficiency of growers in detecting the early index. The services of pest management specialists may be required even with low priced crops to determine the need for and time of control; licensed operators may also be required. Insect pest control strategies other than chemical control should also be studied.

75-0002. Donaldson, W. T. (Southeast Water Lab., Nat. Environ. Res. Cent. - Corvallis, Environ. Protect. Agency, Athens, GA 30601). **A research program for identifying and measuring water pollutants.** *Int. J. Environ. Anal. Chem. 3(1): 1-18; 1973.* (9 references)

EPA established the National Water Contaminants Characterization Research Program at the Southeast Water Laboratory in Athens, Georgia to support both research and enforcement activities in water pollution control. This program is responsible for developing new and improved methods for the identification and measurement of water pollutants. Gas chromatography-mass spectrometry is broadly applicable to the identification of organics, and spark source mass spectrometry and neutron activation analysis show promise for elemental analysis. Highly sensitive and selective methods, such as microwave-induced emission spectrometry, are evaluated for repetitive determination of constituents of known significance. Chemiluminescence and electroanalytical techniques are being investigated for speciation. Application of these methods to the solution of real problems is conducted on a limited scale to bridge the gap between research and broad practical application.

75-0003. Takeda, I. (Nippon Noyaku Co., Ltd., Tokyo, Japan). **[Approaches to safer pesticides.]** *Kagaku Kogyo (Chem. Ind.) (Tokyo) 24(12): 1592-1597; 1973.* (Japanese)

The research and development cost for one agricultural chemical up to the time of marketing in Japan is ca. one billion yen ($3.3 million), only one-third to one-fourth as high as in the United States or Europe. Recently, the marketing of several chemicals in Japan was stopped only a few days before actual sales began, because of results from long-term toxicity tests. Some recently developed agricultural chemicals in Japan are listed according to suggested crop and pest use as well as toxicity to rodent species and fish. Pollution-free insect control techniques are greatly desired for the future. The use of insect hormones and the development and synthesis of pheromones are being examined for the preventive treatment of crops and for combined use with attractant lamps; however, pheromones are not effective against larvae and they are chemically unstable. The use of natural enemies of insects (bacteria and other insects) is also being examined.

75-0004. Ten Houten, J. G. (Inst. Phytopathol. Res., Wageningen, The Netherlands). **Chemicals, environmental pollution, animals and plants.** *Meded. Fac. Landbouwwetensch Rijksuniv. Gent. 38(3): 591-612; 1973.* (49 references)

As the unintentional distribution of pesticides in the global environment becomes apparent, the need to safeguard our environment becomes obvious. Production of pesticides should be carried out with great care to prevent biologically active materials and their by-products and waste products from polluting air, water, and soil. Use of these chemicals, which is increasing rapidly, should be cautious. Application methods which will prevent the loss of more than half of the chemicals to air, soil, and water are needed. However, caution must be maintained not to overlook the important benefits these chemicals have brought mankind. Strict proof that a particular chemical is the cause of undesirable effects must be available if the practice of prohibiting the use of a compound on the basis of little or no scientific evidence is to be stopped.

75-0005. Epstein, S. S. (Case Western Reserve Univ., Med. School, Cleveland, OH 44106) **Introductory remarks to session on "Mutagens in the Biosphere."** *Mutat. Res. 26(4):219-223; 1974.*

The introduction of a great number of new substances into the environment causes the fear that some chemicals may be as important a genetic risk as radiation and evinces that mutagenicity testing must be incorporated into toxicological practice. The Mrak report (1969) recommended that all currently used pesticides should be tested in ancillary microbial systems, the dominant lethal assay, the host mediated assay and in vivo cytogenetics, and in concentrations higher than and routes similar to human exposure. The current status of government proposals on mutagenicity testing is discussed. Prevailing misconceptions include claims that current toxicological testing provides an index of mutagenicity or indicates a need for further mutagenicity testing; that the chemical industry lacks the expertise to undertake mutagenicity testing; and that escalating requirements for safety testing have curtailed

pesticide R and D. (From the First International Conference on Environmental Mutagens, Pacific Grove, CA, Aug. 29-Sept. 1, 1973)

75-0006. Bundy, J. W. (Birds Eye Foods Limited, Walton-on-Thames, Surrey, England). **Pesticides and the processed food industries.** *Pestic. Sci. 5(1): 73; 1974.*

The meeting on Pesticides and the Processed Food Industries, organized on March 19, 1973, by the Pesticides Group, Society of Chemical Industry, stressed the joint interests of chemical manufacturers and vegetable processors. Although the vegetable processing industry is not a major one economically, it is highly specialized and the units of production are large. Since the raw material is often consumed in its natural form, contamination from the field should be nil. While seeking improved chemicals to meet the vegetable processors' need for higher pest control levels, chemical manufacturers must obtain satisfactory returns on research investments. It may be more advantageous for the processor to pay a higher price for clean raw material from pesticide-treated fields than to pay high inspection labor costs and receive consumer complaints.

75-0007. Gair, R.; Sly, J. M. A. (Agr. Develop. Advisory Serv., Cambridge, England). **Survey of pesticide usage in crops grown for processing.** *Pestic. Sci. 5(1): 75-86; 1974.* (8 references)

The usage of pesticides on crops grown mainly for processing is reviewed. Topics presented include: the relative costs of production, the extent of usage of pesticides and the reasons for their use, regional differences and changes in usage, the methods of application, the frequency of application and the growers' assessment of the success of the treatments. Examples of problems in attaining the desirable degree of control are given. (Author abstract by permission)

75-0008. Tahori, A. S. (Israel Inst. Biol. Res., Ness-Ziona, Israel). **Insecticides. Pesticide Chemistry Volume I.** *Gordon and Breach Science Publishers, New York, 1972, 493 p.,*

The future of pesticides is considered. New methods for controlling insects are needed to avoid chemical contamination of the food chain and to overcome insect resistance. Alternative means of insect control, including insect sterilization by radiation or chemosterilants, sex attractants, and pheromones are surveyed. The possibilities of controlling insects with antimetabolites of pathways which exist only in insects, therefore non-toxic to mammals, are discussed. A section of the book deals with insecticides of plant origin, including rotenoids and coumarins, pyrethroids, destruxins, nereistoxin, ryanodine, and quassin. The conjugative metabolism of carbamates in rat liver microsomes, rat intestines, and tobacco budworm and the effect of enzyme induction on the metabolism of organophosphates are considered. The relation of chemical structure to biological activity is discussed and followed by workshop papers on the chemical induction of sterility in insects, especially chemosterilants for male insects and mosquitoes. Proceedings of the Second International IUPAC Congress of Pesticide Chemistry.

75-0009. Ryan, J.; Stoller, R.; Moore, L. (Soils, Water and Engineering Dept., Coll. Agr., Univ. Arizona, Tucson, AZ). **Rural & urban residents differ in their knowledge and attitudes about the use of insecticides.** *Progr. Agr. Arizona 26(3): 6-7; 1974.*

The rural (farmers) and urban public's opinion regarding various facets of insecticide use is surveyed. A consistently higher percentage of farmers felt a need for insecticide use on crops, in the home, in the garden, and on animals; felt that food prices to the consumer would rise if insecticides were prohibited; believed that insecticides could improve the quality of the environment; know that there was a 1972 pesticide law and that it affected them; and knew that the law required sampling of foodstuffs to determine residue concentration. More urban dwellers considered insecticides to be environmental pollutants and were concerned about adverse health effects of pesticide residues in their food. Neither group was well informed on the location of Poison Control Centers in their communities. Both groups considered negligence by adults to be the cause of insecticide poisoning in children. Farmers were in contact with more specialized sources of information regarding insecticides whereas the urban dwellers relied largely on TV and newspapers. The study showed that for educational purposes regarding insecticides, rural and urban populations may be considered as distinct and separate. Effective education is essential, for in a largely urban society, public opposition to insecticides may force legislation based on incorrect information which may be harmful to all.

75-0010. Baluja, G.; Franco, J. M.; Murado, M. A. (Instituto de Quimica Organica General, Madrid, Spain). **Contaminacion del medio por plaguicidas organoclorados. VI. Residuos de insecticidas y PCB en especies marinas, significado ecologico y su relacion con la contaminacion litoral nacional. [Environmental contamination by organochlorine pesticides. VI. Insecticide and PCB residues in marine species, ecological significance and their relation to national littoral contamination.]** *Invest. Pesq. 37(3): 593-620; 1973.* (30 references) (Spanish)

Organochlorine residue levels were determined in organs and tissues of mussels (*Mytilus edulis*), sardine (*Sardinia pilchardus*), and dogfish (*Squalus acanthias* and *B. blainwillei*) from the Mediterranean and Atlantic coasts of Spain. The α-BHC and lindane levels in mussel samples from the Mediterranean and Atlantic coastal

areas were 0.012-0.036 ppm and 0.003-0.036 ppm relative to fresh soft tissue. The aldrin and dieldrin levels in Mediterranean and Atlantic specimens were 0.001-0.025 ppm and 0.001 ppm. The total DDT (*p,p'*-DDE, *p,p'*-TDE, *p,p'*-DDT) levels were 0.025-0.18 ppm and 0.012-0.017 ppm, respectively. The PCB levels formed were 0.58-1.36 ppm and 0.1-0.67 ppm. The BHC, cyclodiene, total DDT, and PCB levels were 0.009-0.027 ppm, 0.001-0.064 ppm, 0.011-0.48 ppm, and 0.68-4.72 ppm in sardines from the Mediterranean coast; 0.004-0.029 ppm, 0.001-0.007 ppm, 0.005-0.084 ppm, and 0.34-0.40 ppm in sardines from the Atlantic. The corresponding levels determined in dogfish from the Mediterranean coasts were up to 0.01 ppm, up to 0.001 ppm, and 0.76-1.01 ppm in the muscle tissue; and 0.001-0.141 ppm, 0.006-0.052 ppm, and 1.91-18.1 ppm in the liver. Muscle tissues of Atlantic dogfish contained 0.005-0.009 ppm BHC, 0.001-0.024 ppm cyclodienes, and up to 0.095 ppm total DDT. The corresponding values for liver samples were 0.003-0.111 ppm, 0.014-0.39 ppm, and 0.61-3.79 ppm. While the contamination levels determined are rather moderate, the residue levels in specimens from the Mediterranean were five to twenty times higher than those in Atlantic specimens.

75-0011. Westoo, G. (Food Lab., Natl. Swedish Food Admin., Fack, Stockholm, Sweden). **Changes in the levels of environmental pollutants (Hg, DDT, dieldrin, PCB) in some Swedish foods.** *Ambio 3(2): 79-83; 1974.* (17 references)

During the past 10 years several regulations have been issued by Swedish authorities to diminish the use of certain persistent pesticides and other toxic compounds found as environmental pollutants. These compounds include DDT, aldrin, dieldrin, and methylmercury compounds. The effects of these measures can now be observed as decreasing pollutant levels in certain foods. For example, the mercury levels in foods of animal origin, e.g. meat, eggs, and liver, have decreased to approximately 1/3 to 1/6 of earlier levels. The mercury levels in fish have also decreased in water areas downstream from several pulp and paper industries; no decrease has been observed in the vicinity of chlorine-alkali industries. The DDT levels in human milk have also decreased, as have the concentrations of dieldrin in fish and the concentrations of DDT and its metabolites in vegetable foods. The average PCB level in human milk has increased due to the consumption of fish from the Baltic.

75-0012. Bengtson, S. A.; Soedergen, A. (Zool. Museum, Univ. Bergen, Bergen, Norway). **DDT and PCB residues in airborne fallout and animals in Iceland.** *Ambio 3(2): 84-86; 1974.* (15 references)

DDT and PCB residues in airborne fallout were studied at three different localities in Iceland. Airborne fallout in the southwest near Reykjavik contained no residues, whereas low levels of both DDT and its metabolites and PCB were detected at the Lake Myvatn location in northeastern Iceland. The reason for this is not known, nor are the sources of the pollutants. Tissue samples from animals at different trophic levels of aquatic ecosystems (chiefly around Myvatn) were analyzed. Animals representing the lower trophic levels contained little or no residue, but in several waterfowl, low levels of DDT and its metabolites were detected. Two species of diving ducks, including one nonmigratory species, also contained PCBs. These residues may have been accumulated during the birds' winter stay in the marine coastal waterrs except in the case of the nonmigratory birds. The highest PCB loads were recorded in two specimens of long-tailed field mouse (*Apodemus sylvaticus*) at Myvatn. Compared with the levels reported from some other parts of the northern hemisphere, the DDT and PCB concentrations found in this study were lower by one or two orders of magnitude.

75-0013. Mezonnet, R.; Berges, P.; Custot, F. (Lab. Cooperatif d'Analyses et de Recherches, Gennevilliers, France). **Residus de fongicides dans les laitues: Quelques resultes d'analyses. [Fungicide residues in lettuce. Analytical results.]** *Ann. Fals. Expert. Chim. 66(710): 203-209; 1973.* (6 references) (French)

Dithiocarbamate (thiram and maneb) residues in lettuce grown in France were determined by spectrophotometry following thin-layer chromatographic identification. Relative to the maximum allowable dithiocarbamate level of 3 mg/kg set for lettuce in both Switzerland and West Germany, 62% of all samples contained thiram residues in excess of this limit. The residue levels were at least 10 times higher in 15% and 100 times higher in 2% of all samples. The findings suggest a need for standardization of dithiocarbamate residues and for increased caution in the use of fungicides.

75-0014. Luquet, F.; Goursaud, J.-G.; Casalis, J. (Lab. Ind. Laitiere, E.N.S.I.A., Douai, France). **Les residus de pesticides organochlorines dans les laits animaux et humains. [Organochlorine pesticide residues in animal and human milk.]** *Ann. Fals. Expert. Chim. 67(716): 217-239; 1974.* (2 references) (French)

Butter; cheese; milk from cows, goats, and ewes; and human milk samples collected in different parts of France in the 1967-1968 and 1971-1972 periods were analyzed for organochlorine pesticide residues. The α-BHC levels in butter samples collected in the 1967-1968 period were usually lower than 0.20 mg/kg, with the highest levels found in the winter and spring periods. BHC isomers had decreased 80% in butter in 1971-1972. However, the heptachlor epoxide levels were usually higher than 0.20 mg/kg, and DDT and its derivatives were detected in concentrations of 0.10 mg/kg and over. Pesticide levels were considerably different in sam-

ples from different regions. Alpha, beta and gamma BHC, heptachlor epoxide, dieldrin, and DDT and its metabolites were found most frequently in milk and cheese in 1972. BHC levels averaged 0.10 mg/kg; hetpachlor epoxide levels reached values exceedings 0.30 mg/kg; the dieldrin and DDT concentrations were usually below 0.10 mg/kg. While the BHC residues tended to decrease, heptachlor epoxide and dieldrin levels slightly increased during the last 5 years. The total BHC, heptachlor epoxide, dieldrin, and total DDT levels found in human milk were 2.75 mg/kg, 0.28 mg/kg, 0.23 mg/kg, and 3.24 mg/kg, respectively.

75-0015. Takano, H. (Iwate Prefect. Inst. of Public Health, Iwate, Japan). **[Results of inspection of pesticide residues in mother's milk and market milk.]** *Iwate-ken Eisei Kenkyusho Hokoku (Annu. Rep. Iwate Inst. of Pub. Health) 15: 88-91; 1972* . (4 references) (Japanese)

Residues of α-, β-, γ-, and δ,-BHC, *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDD (TDE), *p,p'*-DDE, heptachlor epoxide, dieldrin, endrin, and aldrin were determined by GLC in five samples of mothers' milk and in seven samples of cow's milk collected in Jan.-Feb. 1972. The residues in milk from women living in urban areas averaged 0.0018, 0.0718, 0.0024, ND, 0.0027, ND, ND, 0.056, 0.0004, 0.0036, ND, and ND for the above pesticides. Those in rural mothers' milk were 0.0012, 0.0048, 0.001, 0.016, ND, ND, 0.057, 0.006, 0.004, ND, and ND. The average daily intakes of cow milk by urban mothers and rural mothers were respectively 1.2 and 0.2 quarts. The residues in market cow's milk were 0.0097, 0.0088, 0.0014, 0.0021, ND, 0.001, 0.003, trace, 0.0011, ND, and ND. The larger intake of cow's milk by urban mothers is thought to account for the greater pesticide residues.

75-0016. Harvey, G. R.; Steinhauer, W. G. (Woods Hole Oceanographic Inst., Woods Hole, MA 02543). **Atmospheric transport of polychlorobiphenyls to the North Atlantic.** *Atmos. Environ. 8(8): 777-782; 1974.* (13 references)

Concentrations of polychlorobiphenyls were measured in the atmosphere over the western North Atlantic. Both the particulate and vapor phase were extracted, using a new sampler designed for this work. Four sampling stations were used: Vineyard Sound (Massachusetts), Georges Bank, Bermuda, and Grand Banks. The concentration of DDT in the Bermuda samples decreased from 5.3 to 1.7 $\times 10^{-11}$ gm^{-3} recorded on Feb. 12 and 15, resp. The most likely source was the southeastern US cotton fields directly to the west. At the other sampling sites the DDT concentration was less than 1×10^{-2} gm^{-3}. The polychlorobiphenyl concentrations were highest in Vineyard Sound, which is only 150-250 km from the nearest windward industrial sources of Boston, Hartford, New York and New Jersey. Concentrations of polychlorobiphenyls over the Grand Banks, which are over 200 km from the industrial complex of the northeast United States, were 100 time less than in Vineyard Sound. It is noted that when the average concentrations at each station are plotted against the average distance of the site from major industrial centers, the seaward decrease is actually exponential. It is concluded that wind transport is the major source of chlorinated hydrocarbons in the oceans.

75-0017. Walsh, G. E.; Hollister, T. A.; Forester, J. (U.S. Environ. Protect. Ag. Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561). **Translocation of four organochlorine compounds by red mangrove (*Rhizophora mangle* L.) seedlings.** *Bull. Environ. Contam. Toxicol. 12(2): 129-135; 1974.* (6 references)

Organochlorine compounds have been detected in mangrove from natural stands. Red mangrove seedlings planted in boxes containing muddy sand and sea water were treated with acetone solutions of technical grade dieldrin, methoxychlor, mirex, and Aroclor 1242 at 0.038-6.00 ppm in the medium. Seedlings were collected and analyzed once a week for 6 weeks after treatment. Dieldrin was not detected in the mangrove stems or roots; average residues in leaves ranged from 0.072 to 0.0113 ppm but were not related to exposure concentration or time. Methoxychlor was detected in roots and hypocotyls after treatment at high rates. Methoxychlor residues in hypocotyls increased in proportion to exposure time and rate; the maximum residue level was 0.8 ppm. Mirex was detected only in seedlings treated at the highest rates; maximum levels, 0.28 ppm in leaves, were detected at 2 weeks post exposure, and residues in all parts disappeared almost completely by 6 weeks. Aroclor 1242 produced the highest residue values of any of the compounds tested. A maximum of 2 ppm was determined in the mangrove hypocotyls 5 weeks after treatment.

75-0018. Smith, F. A.; Sharma, R. P.; Lynn, R. I.; Low, J. B. (Utah St. Univ., Logan, UT 84322). **Mercury and selected pesticide levels in fish and wildlife of Utah: II. Levels of mercury, DDT, DDE, dieldrin and PCB in chukars, pheasants and water fowl.** *Bull. Environ. Contam. Toxicol. 12(2): 153-157; 1974.* (5 references)

Breast muscle tissue from chukars, pheasants, and selected water fowl (Anatidae sp.) collected in various parts of Utah were analyzed for mercury, DDT, DDE, dieldrin, and PCB residues. The mercury levels averaged 0.05 ppm in the chukars, while 8 of 35 pheasants and 4 of 48 waterfowl equaled or exceeded the 0.5 ppm mercury guideline established by the Food and Drug Administration. Dieldrin was present in 83% of the chukar samples, 96% of the pheasant, and 87% of the waterfowl. DDE was found in 86% of the chukar samples, 85% of the pheasant samples, and 90% of the waterfowl. None of the chukar or pheasant samples contained more DDT + DDE than the 5.0 ppm tolerance guidelines established by the FDA. Two waterfowl samples con-

tained no DDT but had abnormally high DDE levels. Adipose tissue from six chukars and 18 pheasants was analyzed for DDT and DDE; in no instance did the levels exceed the 0.7 ppm tolerance level. The PCB levels in all samples exceeded those of dieldrin, DDT, and DDE. No definite relationship between the levels of mercury and pesticides or PCBs was noted.

75-0019. Archer, T. E. (Dept. Environmental Toxicol., Univ. California, Davis, CA 95616). **The effect of ultraviolet radiation filtered through pyrex glass upon residues of dicofol (kelthane; 1,1′-bis-(*p*-chlorophenyl) 2,2,2-trichloroethanol) on apple pomace.** *Bull. Environ. Contam. Toxicol. 12(2): 202-203; 1974.* (6 references)

The effect of ultraviolet light irradiation filtered through pyrex glass (> 290 nm wavelength) on dicofol residues in apple pomace was studied using a closed system. The samples were analyzed by gas-liquid and thin-layer chromatography. Before irradiation was initiated, only dicofol and 4,4′-dichlorobenzophenone (DBP) were detected. The average DBP levels increased from 1.5% to 14.9% of the total dicofol residue during the irradiation treatment. If other compounds were present in the pomace, they occurred in such small concentrations as to be nondetectable by the analytical procedures employed.

75-0020. Epps, E. A., Jr.; Bonner, F. L.; Cowart, R. P. (Louisiana Agr. Exp. Sta., Baton Rouge, LA 70803). **Dieldrin contamination of milk by use of second-hand bags for feed.** *Bull. Environ. Contam. Toxicol. 12(2): 209-211; 1974.*

In September, 1968, milk from seven dairies in Tangipahoa Parish was condemned by the Louisiana Department of Health because of excessive dieldrin residues (0.5-1.5 ppm). The affected milk was analyzed weekly for pesticide residues using gas-liquid chromatography. The last of the milk was clear of residues in April of 1969, but later in the month the dieldrin content rose sharply. A sample of cottonseed meal from one dairy in late May showed 0.4 ppm aldrin; two later samples contained 8.7 and 7.1 ppm aldrin. Significant amounts of aldrin were absorbed by cottonseed meal packaged in second-hand burlap bags which had previously been used for rice seeds treated with aldrin. Investigation of a case of excessive dieldrin residues in laying hens showed that meat scraps had been contaminated by the use of second-hand rice seed bags. The feed industry should be particularly careful about the reuse of bags.

75-0021. Smith, F. A.; Sharma, R. P.; Lynn, R. I.; Low, J. B. (Utah State. Univ., Logan, UT 84322). **Mercury and selected pesticide levels in fish and wildlife of Utah: I. Levels of mercury, DDT, DDE, dieldrin and PCB in fish.** *Bull. Environ. Contam. Toxicol. 12(2): 218-223; 1974.* (9 references)

Muscle tissues from 11 different species of fish collected from various parts of Utah were analyzed for mercury, dieldrin, DDT, DDE, and PCB residues. The mercury levels were generally lower than the Federal guideline limit (0.5 ppm) in most fish except those obtained from one localized area (Willard Bay Reservoir). Dieldrin was found in 56% of the samples, ranging in concentration from 0 to 0.038 ppm. No dieldrin was found in any of the samples from Willard Bay Reservoir. DDT was found in 85% of the samples (0.011-0.075 ppm), and DDE was found in 95% of the samples. PCBs were found in 93% of the samples in levels ranging from 0.05-0.97 ppm. No definite relationship between the levels of mercury and pesticides or PCBs was found.

75-0022. Watts, R. R.; Storherr, R. W.; Onley, J. H. (Registration Div., Environ. Protect. Ag., Washington, DC 20250). **Effects of cooking on ethylenebisdithiocarbamate degradation to ethylene thiourea.** *Bull. Environ. Contam. Toxicol. 12(2): 224-226; 1974.* (2 references)

Samples of chopped spinach, carrots, and potatoes were fortified at 10 ppm (1 mg) each with the ethylenebisdithiocarbamate (EBDC) compounds, maneb, dithane M-45 and manzate 200 (combinations of manzate with zinc ion), and polyram before and after cooking. The samples were then analyzed for ethylene thiourea (ETU) using gas-liquid chromatography with flame photometric detection (S-mode). All EBDC compounds produced significant amounts of ETU after cooking; the amount of ETU formed ranged from 11.2% for maneb in potatoes to 26.5% for polyram in spinach. Cooking did not diminish the ETU content in samples fortified with 10.0 ppm ETU before cooking. Boiling of the EBDC compounds without vegetables resulted in a similar degree of ETU production. Thus, the EBDC content of a food should be considered in addition to ETU residues on the raw agricultural commodities for any realistic evaluation of ETU exposure in the consumer.

75-0023. Markin, G. P.; Collins, H. L.; Spence, J. H. (U.S. Dept. Agr., Animal Plant Health Inspection Serv., Gulfport, MS 39501). **Residues of the insecticide mirex following aerial treatment of Cat Island.** *Bull. Environ. Contam. Toxicol. 12(2): 233-240; 1974.* (7 references)

Beginning in 1968, an oil-based mirex bait was applied three times to Cat Island in an attempt to eradicate the red imported fire ant from a limited and isolated area. A total of 45 pounds of the insecticide was applied to the island and its surrounding waters and bays. The mirex residues in 20 individual animal groups, soil, water, and sediment were monitored for three years after the initial treatment. High residue levels in ants, crickets, cockroaches, and marine organisms such as catfish and mullet immediately after the first application indicated that the organisms were feeding directly on the bait. The mirex was rapidly lost from the fish. Other organisms such as oysters and fiddler crabs showed a

gradual increase for several weeks after application, indicating that they were either concentrating the mirex from the seawater or receiving it at an early step in the food chain. Predators such as lizards, toads, and spiders showed a more gradual buildup over the entire treatment period. Up to 3 years after the last treatment, all organisms except toads were found in abundance. The exceptions were shrimp and crabs in a land-locked salt-water pond; high residue levels after the third application were correlated with decreased numbers of these organisms. The insecticide treatment eradicated the imported fire ant from the island, but it was soon reinfected by newly mated queens flying from the continent. A similar reduction in the numbers of the Florida harvester ant was noted; no new colonies were found even after three years. Five other species of ants were apparently not affected by the mirex treatment.

75-0024. Yule, W. N. (Chem. Control Res. Inst., Environment Canada, Canadian Forestry Serv., Ottawa, Ontario, Canada). **The persistence and fate of fenitrothion insecticide in a forest environment. II. Accumulation of residues in balsam fir foliage.** *Bull. Environ. Contam. Toxicol. 12(2): 249-252; 1974.* (4 references)

In the spring of 1973, the accumulation of fenitrothion residues by coniferous foliage in areas of New Brunswick which had been sprayed with the insecticide for up to five consecutive years was surveyed. No measurable amounts of fenitrothion or known breakdown products were found in any of the soils sampled, regardless of their spray history. The foliage of balsam fir trees did contain measurable year-end residues but no major breakdown products; the residues appeared to accumulate in the foliage in proportion to the number of years sprayed and the dosage applied. The maximum accumulated residue level was approximately one ppm fenitrothion.

75-0025. Musial, C. J.; Hutzinger, O.; Zitko, V.; Crocker, J. (Atlantic Reg. Lab., Nat. Res. Council Canada, Halifax, Nova Scotia, Canada). **Presence of PCB, DDE, and DDT in human milk in the provinces of New Brunswick and Nova Scotia, Canada).** *Bull. Environ. Contam. Toxicol. 12(3): 258-267; 1974.* (20 references)

The levels of PCB, DDT, and DDT derivatives were investigated in human milk from New Brunswick and Nova Scotia. A total of 15 lactating mothers supplied milk for the study. Several samples of commercially prepared infant formulas were also analyzed. Levels of DDT and its derivatives were somewhat higher in New Brunswick, while PCB levels were about the same for the two localities. The mean for DDT derivatives in human whole milk in New Brunswick was 0.035 ppm as compared to 0.019 in Nova Scotia. The mean for DDT in human whole milk from New Brunswick was 0.013 ppm compared to 0.006 ppm in Nova Scotia. This distinction is possibly due to wide use of insecticides as sprays in the past. Only trace quantities (less than 0.003 μg/g wet weight) of DDT and its derivatives were detected in the prepared infant formulas. PCBs in the form of Aroclor 1254 were not detected in any of the prepared infant formulas. However, PCB as Aroclor 1242 was detected at 0.0888 ppm in the undiluted formula. It is thought that peaks corresponding to Aroclor 1242 were also seen in all breast milk samples.

75-0026. Suzuki, M.; Yamato, Y.; Watanabe, T. (Kitakyushu Municipal Inst. Pub. Health, Kitakyushu, Japan). **Photodieldrin residues in field soils.** *Bull. Environ. Contam. Toxicol. 12(3): 275-280; 1974.* (20 references)

Photodieldrin residues were measured in field soils which had been planted with radishes, cabbages, spinach, carrots, chinese cabbages, cucumbers, turnips, grapes, tomatoes, egg plants, and lettuce. Soil texture was sand to loam. Dieldrin was detected at levels of 1.726 to 0.002 ppm in 52 of 99 soil samples tested. In 14 of these 52 samples, photodieldrin was found at levels above 0.001 ppm. All of these agricultural fields in which photodieldrin residues were detected had been planted with cucumbers. Residues may have occurred because the cucumber grows in the most humid and hot season of the year when many pests appear, necessitating the heavy use of pesticides. Simultaneously, the strong UV light of the summer irradiated the dieldrin on the soil surface which had been treated with aldrin or dieldrin and photoisomers formed on them. The ratio of photodieldrin to dieldrin was 6.9 to 0.6%, suggesting that the photodieldrin residues were formed from dieldrin by a photochemical and microbial action.

75-0027. Albright, R.; Johnson, N.; Sanderson, T. W.; Farb, R. M.; Melton, R.; Fisher, L.; Wells, G. R.; Parsons, W. R.; Scott, V. C.; Stallworth, J. R.; Moore, B. G.; Hayes, A. W. (Dept. Biol., Univ. Alabama, University, AL 35486). **Pesticide residues in the top soil in five west Alabama counties.** *Bull. Environ. Contam. Toxicol. 12(3): 378-384; 1974.* (9 references)

The distribution of pesticides was studied in randomly selected soil samples taken from diverse environments in five west Alabama counties. The two most prevalent pesticides, the chlorinated hydrocarbons benzene hexachloride (BHC) and aldrin, were detected in 75% of the samples. Malathion, the most frequently found organophosphate, was detected in 43%. Atrazine and 2,4,5-T were found in 35% and 24%, respectively. DDT was not detected to any significant extent in any sample, perhaps due to restricted use during the last 10 years. Data was not available concerning the amounts of pesticide which had been applied to the areas studied. However, chlorinated hydrocarbons such as BHC and aldrin were detected in drainage ditches and uncultivated forest where pesticides had not been applied directly, thus confirming existing evidence of wind drift and rain-

water wash-off aiding spread of pesticides into non-target areas.

75-0028. Pearcy, W. G.; Claeys, R. R. (Dept. Oceanography, Oregon State Univ., Corvallis, OR). **Zinc-65 and DDT residues in albacore tuna off Oregon in 1969.** *Calif. Mar. Res. Comm. 166: 66-73; 1974.* (32 references)

Samples of liver and flesh from Albacore tuna caught off the coast of Oregon in 1969 were assayed for pesticide residues by radioanalysis. Gamma-ray spectra revealed zinc-65 (Zn-65) as the prominent artificial radioisotope present in albacore livers. The major DDT residue in albacore tissue was *p,p'*-DDE, which was found in concentrations up to 0.16 ppm; *p,p'*-DDT, *o,p'*-DDT, and *p,p'*-TDE were usually present. No dieldrin residues were found. The DDE concentrations in the lateral lobes of the liver were up to 7 times greater than in the long median lobes. The concentrations of DDT residues in the liver did not vary significantly over the summer. Although the concentrations and specific activity of Zn-65 did not correlate with the concentrations of *p,p'*-DDE, *p,p'*-DDT, or DDT, the correlation between the specific activity of Zn-65 and DDE was significant. The data indicates that the Columbia River is not a major source of DDT in the ocean waters off Oregon.

75-0029. Brewer, D. G.; Wood, G.; Unger, I.(Dept. Chem., Univ. New Brunswick, Fredericton, New Brunswick, Canada). **The photodecomposition of fenitrothion (*O,O*-dimethyl-*O*-(3-methyl-4-nitrophenol)phosphorothioate).** *Chemosphere 3(3): 91-95; 1974.* (13 references)

The photolysis of fenitrothion in vapor and liquid phase has been examined, using radiation available in the solar spectrum, i.e., $\lambda > 300$ nm. In both the vapor phase and ethanol solution, two primary products were produced, the major one being *p*-nitrocresol (4-nitro-3-methyl-phenol). The other product was not identified. Prolonged irradiation yielded additional products, probably due to secondary photolysis. These results thus indicate that photolysis of fenitrothion both in liquid and gaseous phases will occur on the absorption of radiation present in sunlight at the surface of the earth. This photodegradation of fenitrothion may therefore play an important role when that material is introduced into the environment. The recently demonstrated atmospheric photo reactions of DDT are mentioned, and it is noted that DDT is a far less volatile compound than fenitrothion.

75-0030. Gaeb, S.; Parlar, H.; Korte, F. (Inst. fuer Oekol. Chemie, Technische Universitaet Munich, Freising-Weihenstephan, Germany). **Beitraege zur oekologischen Chemie LXXXII. Reaktionen von Photodieldrin als Festkoerper auf Glas und adsorbiert an Kieselgel bei UV-Bestrahlung. [Contributions to environmental Chemistry, Part 82. Reactions of photodieldrin in the form of a solid on glass and adsorbed on silica gel under UV irradiation.]** *Chemosphere 3(5): 187-192; 1974.* (9 references) (German)

Chemical reactions and transformation were studied using photodieldrin adsorbed on glass or silicagel in the form of a solid under UV irradiation at wavelengths over 230 nm. Photoaldrin chlorohydrin and two different photoaldrin ketones were identified as the chief reaction products by column chromatography, IR, neutron magnetic resonance, and mass spectrometry. Low-molecular substances with reduced number of chlorine atoms compared to photodieldrin and higher-molecular fragmentation products were also found. Bathochromic shifting of the absorption maximum of solid adsorbed photodieldrin from 193 nm as measured in *n*-hexane to 264 nm on silica gel was observed. Adsorbed photodieldrin was excitable at wavelengths over 300 nm, which implies possible degradation or metabolism of this substance under the photochemical conditions prevailing in the surface layer of the atmosphere.

75-0031. Krasil'shchikov, D. G. (Sci. Res. Inst. Epidemiol., Microbiol. and Hyg., Ministry of Public Health of the Lithuanian SSR, Vilnyus, USSR). **Ob opasnosti zagryazneniye pestitsidami iskusstvenno popolnyayemykh zapasov podzemnykh vod. [Danger of pesticide pollution of artificially replenished groundwater reserves.]** *Gig. Sanit. 39(8): 90-91; 1974.* (2 references) (Russian)

The percolation of sodium trichloroacetate and hexachlorocyclohexane present in river water with or without detergent (sulfonol NP-1) was studied in sandy soil with particle sizes of 0.5 and 0.12 mm. Possible contamination of artificially replenished groundwater was investigated. The sodium trichloroacetate concentrations in the water were 5 and 50 mg/kg; the detergent concentrations were 0.5 and 5 mg/kg. Quantitative penetration of the pesticide to depths of 1.5 m and over was observed after 1 to 2 days, after which the penetration decreased temporarily due to the growth of the microflora on the soil surface. Leachout of the adsorbed pesticide occurred later. Detergent had little effect on the penetration of the pesticide, while it significantly increased the rate and depth of penetration of hexachlorocyclohexane. The findings indicate only slight, partial adsorption of water-soluble pesticides by sandy soils; adsorption is reduced by detergents. The maximum allowable concentration of anionic detergents in water in the presence of pesticides is set at 0.5 mg/liter.

75-0032. Antonovich, Ye. A.; Murav'ev, N. N.; Vekshteyn, M. Sh. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR). **Gigiyenicheskaya otsenka primeneniya tsineba v**

sel'skom khozyaystve. [Hygienic evaluation of agricultural use of zineb.] *Gig. Sanit. 39(8): 100-101; 1974.* (Russian)

Studies are described on the toxicity, degradation, and residue dynamics of zineb in produce. Zineb, a pesticide of low oral toxicity, is degraded in soil in one month, while its metabolites, ethylene thiourea and ethylene thiuram monosulfide, persist for 1.5 to 2 months. Zineb is decomposed in a few days in water and in a few hours at low pH values. Zineb is present mainly in the skin of fruits after spraying. The residue level is usually below 0.5 mg/kg after 20 days in apples, while the ethylene thiourea and ethylene thiuram monosulfide residues are below 0.1 mg/kg. Boiling, baking, washing, and peeling of fruits and other produce are highly effective in the elimination of zineb. The necessary waiting period after application is 20 days, but 30 days is recommended for vineyards. The maximum allowable zineb concentrations in produce in general and in cereals in particular are 0.6 mg/kg and 1 mg/kg, respectively.

75-0033. Pierce, R. H., Jr.; Olney, C. E.; Felbeck, G. T., Jr. (Dept. Food Resource Chem., Univ. Rhode Island, Kingston, RI 02881). ***p,p'*-DDT adsorption to suspended particulate matter in sea water.** *Geochim. Cosmochim. Acta 38(7): 1061-1073; 1974.* (31 references)

A study was made to determine what fraction of suspended particulate matter is responsible for adsorbing *p,p'*-DDT from sea water and to investigate the mechanism of adsorption to that fraction. For the model system used here, an equilibrium concentration of 0.1 ppb DDT in distilled water and a suspended load of 10 mg/l. consisting of 80% montmorillonite clay and 20% humic acid was assumed to approximate a polluted estuarine system. In 1 liter of this system, the amount of DDT adsorbed to montmorillonite clay would be 34 ng (4200 ppb) and to humic acid, 152 ng (76,000 ppb). Therefore, about 35% of the total DDT would be in solution, 12% would be adsorbed to clay and 53% to humic acid. This study supports the theory that DDT adsorption occurs by electrostatic attraction between hydrogen atoms on the aromatic rings and negatively charged sites on the clay surfaces. The humic acid polymer presents a very heterogeneous surface to DDT molecules ranging from easily accessible surface sites to less accessible internal voids. In a polar solvent, as water, the affinity of DDT for hydrophobic surfaces is enhanced. It is concluded that the suspended humic matter is the agent most responsible for scavenging chlorinated hydrocarbons from sea water and transporting them through the water column.

75-0034. Addison, J. B.; Silk, P. J.; Unger, I. (Dept. Chem., Univ. New Brunswick, Fredericton, New Brunswick, Canada). **The photochemical reactions of carbamates. III. The solution photochemistry of metacrate, 3-methylphenyl-*N*-methyl carbamate.** *Int. J. Environ. Anal. Chem. 3(1): 73-79; 1973.* (13 references)

The photodecomposition of Metacrate (MTMC) at $\lambda > 265$ nm in aerated and degassed ethanol and cyclohexane solutions and in aerated carbon tetrachloride solutions was studied. In ethanol solutions, the major photoproducts were *m*-cresol (I); 2-hydroxy-4-methyl-*N*-methylbenzamide (II); 4-hydroxy-2-methyl-*N*-methylbenzamide (III); and a product arising out of the secondary photolysis of III (IV). Small quantities of oxidation products were also observed in the aerated solutions. These photoproducts are those expected from a photo-Fries rearrangement of the Metacrate molecule. In aerated and degassed cyclohexane solutions, photo-Fries rearrangement products other than I were not observed; I was the major product. Similar results were obtained with the aerated carbon tetrachloride solutions. Thus, the photo-Fries rearrangement for Metacrate solutions appears to be solvent dependent. Toluene was also observed as a product in ethanol solutions.

75-0035. Baratov, K. B. (Dushanbe Inst. Epidemiol. Hyg., Dushanbe, USSR). **O gigiyenicheskoy otsenke produktov pitaniya v svyazi s khimizatsiyey sel'skogo khozyaystva Parkharskogo rayona Tadzhikskoy SSR. [Hygienic study of nutritive products in relation to chemical improvement of agriculture in the Parkharsk region of the Tadzhik SSR.]** *Izv. Akad. Nauk Tadzh. SSR. Otd. Biol. Nauk 3: 30-33; 1973.* (11 references) (Russian)

Organochlorine pesticide residues were determined in fruits and vegetables grown in the Parkharsk region of the Tadzhik SSR in the 1968-1969 period. Both the percentage of contaminated samples and the residue levels were higher in produce from household plots than in such from cooperatives. The percentages of samples of cabbage, potato, onion, cucumber, tomato, beet, carrot, pepper, apple, peach, and dried apricots contaminated with DDT and BHC were 51.3% and 30%. The frequency of contamination of produce from household plots and cooperatives was 66.6% and 36% for DDT, and 37.6% and 21.3% for BHC, respectively. The DDT residues in cabbage, apples, onions, peaches, and dried apricots reached up to 3 mg/kg. The BHC residue levels were between 0.5 and 1 mg/kg in certain cabbage, tomato, and apple samples from household plots.

75-0036. Baratov, K. B. (Dushanbe Inst. Epidemiol. Hyg., Dushanbe, USSR). **Ostatochnoye soderzhaniye khlororganicheskikh pestitsidov v sutochnykh pishchevykh ratsionakh zhiteley nekotorykh rayonov Tadzhikskoy SSR. [Residual content of organochlorine pesticides in the daily diet of inhabitants of several regions of the Tadzhik SSR.]** *Izv. Akad. Nauk Tadzhik. SSR, Otd. Biol. Nauk 4: 30-32; 1973.* (6 references) (Russian)

Results of systematic analyses of the daily diet for DDT and BHC residues in the Tadzhik SSR in the 1967-1971 period are presented. The percentages of samples containing DDT were 27.1% in 1967, 23.4% in 1968, 46.6% in 1969, and 10.8% in 1971; in the latter years, salads made from fresh vegetables were excluded. The average DDT contents were 0.8 mg/day in 1967, 0.62 mg/day in 1968, 0.23 mg/kg in 1969, and 0.21 mg/kg in 1971. Both DDD and DDE were detected at respective averages of 0.08 mg/day and 0.11 mg/day. None of the samples contained BHC.

75-0037. Weber, J. B.; Carringer, R. D. (Author address not given). **Sorption of triazine herbicides by smectite layer silicates.** *J. Elisha Mitchell Sci. Soc. 89(4): 251-252; 1973.*

Herbicide activity is related to the amounts and kinds of layer silicates and organic colloids present and the pH of the various soil systems. Sorption studies of 31 structurally related triazines, including herbicides, fungicides, and related metabolites, by sodium saturated smectite layer silicates showed that maximum adsorption occurred at pH levels in the vicinity of the pKA of each compound. X-ray diffraction showed that the herbicides were adsorbed at the interlayer surfaces. Substitution in the 4- and 6- positions showed that dialkylamine compounds were adsorbed in greater amounts than were monoalkylamino substituted compounds. Sorption decreased with a decrease in the length of the carbon chain. With monoalkylamino substituted compounds, the larger the alkylamino group, the greater the retention. Compounds of higher basicity were adsorbed in greater amounts than compounds of lesser basicity. In studying the mechanisms of adsorption, it was suggested that adsorption at high pH levels was due to physical processes. Adsorption at low pH was attributed to coulombic (cation exchange) forces and direct association of triazine molecules with hydrogen on the smectite surfaces.

75-0038. Gaskin, D. E.; Smith, G. J. D.; Arnold, P. W.; Louisy, M. V.; Frank, R.; Holdrinet, M.; McWade, J. W. (Dept. of Zool., Coll. of Biol. Sci., Univ. of Guelph, Guelph, Ontario, Canada). **Mercury, DDT, dieldrin, and PCB in two species of Odontoceti (Cetacea) from St. Lucia, Lesser Antilles.** *J. Fish. Res. Bd. Can. 31(7): 1235-1239; 1974.* (22 references)

Samples of blubber, muscle, liver, and kidney of short-finned pilot whale *Globicephala macrorhyncha* and long-snouted dolphin *Stenella (longirostris* ?) from waters adjacent to St. Lucia, Lesser Antilles, were analyzed for Hg, DDT, dieldrin, and PCB. Total Hg levels were high, ranging from 1.33 to 5.36 ppm in muscle (methylated fraction 42-100%), 2.28 to 14.00 ppm in kidney (methylated fraction about 14%), and 13.00 to 157.00 ppm in liver (methylated fraction 2-17%). ΣDDT in blubber ranged from 1.25 to 7.38 ppm, dieldrin in blubber from 0.007 to 0.04 ppm, and PCB in blubber from 0.69 to 5.00 ppm. The presence of the high Hg levels is attributed largely to natural sources, as the Lesser Antilles Island Arc is a site of intense cyclic tectonic activity. There may be some contribution from atmospheric sources. Both DDT and PCB could be largely the result of atmospheric transportation from higher Atantic latitudes, although local DDT spraying programs may have contributed. Certainly the circulation pattern in the Gulf of Mexico and Caribbean appears to rule out water-borne transport from the river systems of the Gulf States of the United States. (Author abstract by permission)

75-0039. Dilworth, T. G.; Pearce, P. A.; Dobell, J. V. (Northeastern Wildlife Sta., Univ. of New Brunswick, Fredericton, E3B 5A3, Canada). **DDT in New Brunswick woodcocks.** *J. Wildl. Manage. 38(2): 331-337; 1974.* (15 references)

One hundred and sixty-four DDT analyses were conducted on breast muscle of 527 American woodcocks collected in New Brunswick during the fall in

1969, 1970, and 1971. DDT residues (= *p,p'*-DDE + *p,p'*-DDD + *p,p'*-DDT) were detected in all samples, the mean concentration of 2.07 ppm (dry weight) being somewhat higher than levels found in 1959-61. Residue levels (wet weight) in woodcocks were directly correlated ($P < 0.01$) to the amount of DDT sprayed at the collection sites during forest protection operations against spruce budworm (*Choristoneura fumiferana*) in 1952-68. No significant difference ($P > 0.05$) in DDT residue concentrations could be attributed to the age of the birds. DDT levels did not change significantly ($P > 0.05$) in woodcock samples taken from the same site throughout the fall season. There was a significant ($P < 0.01$) correlation between DDT levels (dry weight) in wings and in breast muscle, indicating the usefulness of wings, which are collected for other purposes, for DDT residue monitoring. (Author abstract by permission)

75-0040. Guarino, J. L.; Shake, W. F.; Schafer, E. W. (U. S. Bur. Sport Fisheries and Wildl., Wildlife Res. Cent., Denver, CO 80225). **Reducing bird damage to ripening cherries with methiocarb.** *J. Wildl. Manage. 38(2): 338-342; 1974.* (11 references)

An experimental repellent, methiocarb (4-[methylthio]-3,5-xylyl *N*-methylcarbamate), was evaluated as a 0.16 percent spray treatment for reducing bird damage to ripening cherries in a sweet cherry (*Prunus avium*) orchard and a tart cherry (*P. mahaleb*) orchard in Michigan in 1971. Bird damage to untreated fruit was high (at harvest, over 45 percent in sweet cherries and over 50 percent in tart cherries). Robins (*Turdus migratorius*) and common grackles (*Quiscalus quiscula*) caused most of the damage to the sweet cherries; starlings (*Sturnus vulgaris*), to the tart cherries. In both orchards, bird damage at 6 days after methiocarb treatment was significantly less in treated than in untreated trees. Methiocarb residues in the pulp of sweet cherries averaged 1.23 ppm at 15 days after treatment. These residues are well below the 7 ppm tolerance currently being sought by the manufacturer. Methiocarb residues in the pulp of tart cherries were very high, mainly due to the small fruit size. The cherries contained 39.91 ppm 12 days after the first treatment and 46.81 ppm at harvest, 2 days after the second treatment. (Author abstract by permission, modified)

75-0041. Chesalin, G. A.; Filippova, N. V.; Timofeyeva, A. A. (All-Union Sci. Res. Inst. of Fertilization and Agronomical Soil Science, Moscow USSR). **Rol' mineral'nogo pitaniya v detoksikatsii gerbitsidov v rasteniyakh. [Role of mineral nutrition in the detoxication of herbicides in plants.]** *Khim. Sel. Khoz. 11(10): 767-770; 1973.* (3 references) (Russian)

The effects of nitrogen, phosphorus, and potassium in soil on the phytotoxicity and residue levels of prometryne, atrazine, propazine, and 2,4-D were studied in different plants. The propazine residue level in carrots was highest in soils with high nitrogen level, and lowest in soils with balanced nitrogen, phosphorus, and potassium supply during the first stage of the vegetation period. Propazine was no longer detectable at harvesting. Excess nitrogen and potassium were responsible for high prometryne residue levels in carrots while excess phosphorus reduced the residue content. The atrazine levels in sunflower were lowest in soils with high phosphorus and potassium contents. Potentiation of the phytotoxic and yield-reducing effect of 2,4-D amine salt by abundant nitrogen fertilization in winter wheat was observed.

75-0042. Samgin, P. A.; Krutikova, L. N. (Leningrad Sci. Res. Inst. Forestry, Leningrad, USSR). **Inaktivatsiya TKhA v dernovo-podzolistoy pochve na parovykh polyakh lesnykh pitomnikov v Leningradskoy oblasti. [Inactivation of TCA in podzolic soil in tree nurseries in the Leningrad region.]** *Khim. Sel. Khoz. 12(6): 455-457; 1974.* (9 references) (Russian)

The inactivation and elimination of TCA in moist podzolic soils in tree nurseries in the Leningrad region were studied in model and field tests. The inactivation of TCA was determined from the longitudinal growth of wheat and oat plants used as indicator plants in the model experiment. TCA was most rapidly inactivated in slightly loamy podzolic soil, while inactivation was slowest in soils with medium loam content in which a TCA level of 5-6 mg/kg was measured one and a half vegetation periods after introduction of TCA in a concentration of 55 mg/kg. These findings were confirmed by field tests in tree nurseries with TCA expenditures corresponding to 55 mg/kg. TCA residues were no longer found in the upper 40 cm layer of slightly loamy podzolic soils.

75-0043. Mahieu, H. (Section Lait de l'Institut Technique de l'Elevage Bovin, Ecole Nationale Superieure de l'Agriculture, Rennes, France). **L'evolution de la contamination du lait par les insecticides organochlores entre 1970 et 1972. [The evolution of the contamination of milk by organochlorine insecticides in the 1970-1972 period.]** *Lait 54(533-534): 165-179; 1974.* (3 references) (French)

The evolution of the contamination of milk by organochlorine pesticides and the principal sources of contamination were studied on the basis of regular analyses of cattle feed and milk samples from 89 dairy farms scattered all over France in the 1970-1972 period. Concentrated fodder, cereals, and oil cake investigated contained relatively small quantities of BHC, heptachlor epoxide, dieldrin, and DDT residues, partly a result of the ban on the use of organochlorine pesticides in cattle feed storage facilities. Beet pulp contained increased heptachlor epoxide levels. BHC levels decreased, and heptachlor epoxide increased in hay. Fresh feed was principally contaminated by α-BHC, heptachlor epoxide,

and dieldrin. The findings indicate that cattle feed has become the major source of contamination by organochlorine pesticides in milk. In general, contamination levels in milk decreased. The hexachlorobenzene residue was always below 300 ppb in milk, but the heptachlor epoxide levels have been increasing due to the use of contaminated beet pulp. The dieldrin levels were well below the maximum allowable concentration.

75-0044. Igarashi, H.; Arita, H.; Uchiyama, M.; Sato, R. (Fac. of Agr., Tokyo Univ. of Agr. and Technol., Tokyo, Japan). **[Fate of pentachloronitrobenzene in soil and plants.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 79-81; 1974.* (Japanese)

Pentachloronitrobenzene was mixed with air-dried soil. After adding water to adjust the moisture content to a predetermined value, the mixture was kept in a climate-controlled chamber at 30°C for six months. The soil was then dried and the content of pentachloronitrobenzene (PCNB) and its metabolites, pentachloroaniline (PCA) and pentachlorophenyl methyl thioether (PCTA), was determined. PCNB decreased from an initial value of 40 ppm to 19.3 ppm (in silty loam) or 9.28 ppm (in sandy loam); PCA was detected at 10.5 ppm (in silty loam) or 3.22 ppm (in loam); and PCTA was detected at 1.40 ppm (in silty loam) or N.D. (sandy loam). ^{14}C-PCNB was treated as above, and the ^{14}C was retained bound to the soil. ^{14}C was identified as alkali-soluble bound matter in the soil. The levels of PCNB, PCA, and PCTA in crops which were treated with 20% PCNB at 20 kg/10 A were higher in root crops (3.66, 0.385 and 0.080 ppm), lower in leaf crops (0.0136, 0.015 and 0.0228 ppm), and very low in fruit crops. When maize was grown in water containing ^{14}C-PCNB, almost all the absorbed ^{14}C was found in the root, and translocation to the aerial parts was slight. Two unknown metabolites were found in the root and aerial parts along with PCA and PCTA.

75-0045. Beck, J.; Hansen, K. E. (Nat. Food Inst., Dept. of Food Additives, Pestic., and Contaminants, DK-2860, Seborg, Denmark). **The degradation of quintozene, pentachlorobenzene, hexachlorobenzene, and pentachloroaniline in soil.** *Pestic. Sci. 5(1): 41-48; 1974.* (7 references)

The disappearance of quintozene (I) and its technical impurities and metabolites, pentachlorobenzene (III), hexachlorobenzene (IV) and pentachloroaniline (V), from soil was studied in laboratory experiments under controlled conditions during a period of about 600 days. The very high persistence found was confirmed by the analysis of 22 samples collected from fields used for potato growing and treated regularly during the foregoing 11 years with commercial formulations of quintozene. In the laboratory experiments III, V, and methylthiopentachlorobenzene (VI) were found to be degradation products from the quintozene. (Author abstract by permission)

75-0046. Abdalla, N.; Raski, D. J.; Lear, B.; Schmitt, R. V. (Dept. of Nematol., Univ. of California, Davis, CA 95616). **Distribution of methyl bromide in soils treated for nematode control in replant vineyards.** *Pestic. Sci. 5(3): 259-269; 1974.* (12 references)

Methyl bromide was applied with and without polyethylene covers at rates of 337, 449, 673, and 898 kg/ha to replant vineyard soils to control plant parasitic nematodes. Distribution of the gas in the soil atmosphere at different depths was measured by gas chromatography. Higher doses, low soil moisture and deeper placement of methyl bromide resulted in more rapid soil penetration and higher concentrations of the gas at the deeper soil levels. Placement of methyl bromide in the soil at 0.76–0.81 m without polyethylene cover resulted in gas distribution at concentrations sufficient for nematode kill as deep as 2.44 m. (Author abstract by permission)

75-0047. Ingram, G. H.; Pullin, E. M. (Res. Lab., May & Baker Ltd., Dagenham, Essex, RM10 7XS, England). **Persistence of bromoxynil in three soil types.** *Pestic. Sci. 5(3): 287-291; 1974.* (3 references)

The persistence of bromoxynil octanoate has been studied in clay loam, fen peat and sand soils. Application of the herbicide at 1.12 kg/ha (16 oz/acre) active ingredient, as the octanoate, produced mean initial residues of 0.91, 0.53 and 0.35 mg/liter in the clay, peat and sand respectively, but declined to below the level of detection, 0.11, 0.09, and 0.14 mg/liter in the clay, peat, and sand after 28, 44, and 14 days respectively. The rate of decline was inversely related to the sum of the organic matter and clay components of the soils. (Author abstract by permission)

75-0048. Demozay, D. (Author address not given). **Questions et reponses a propos du lindane. [Questions and answers on lindane.]** *Phytoma 248: 27-32; 1973.* (3 references) (French)

The physicochemical, toxicological, and general environmental properties of lindane are described with respect to other organochlorine pesticides. The relatively high water solubility and vapor pressure of lindane make this pesticide less persistent than other organochlorine products. Lindane is used at low expenditures due to its high activity. Rapid elimination of lindane is partly due to its rapid evaporation, rapid diffusion in the soil, the insignificant and reversible adsorption on organic matter in soil, and to microbial activity. The persistence of lindane in biological materials like plants is comparable to that of parathion. Lindane is degraded by microorganisms like *Bacterium coli, Chlorella vulgaris,* and *Chlamydomonas reinhardti* and in insects and vertebrates. Rapid establishment of an upper lindane level in the adipose tissue after repeated ingestion and rapid elimination after removal of the lindane dose were observed. Food products analyzed for lindane residues

contained less than 1% of the acceptable daily intake. The acute LD50 was 125 mg/kg in rats. Lindane did not have teratogenic or mutagenic properties.

75-0049. Bojanowska, A.; Jonczyk, H.; Rudowski, W.; Traczyk, Z.; Klawe, Z. (Dept. Sanit. Toxicol., State Inst. Hygiene, Warsaw, Poland). **Zawartosc DDT i gamma-HCH we krwi oraz w tkance tluszczowej osob nie stykajacych sie zawodowo z tymi zwiazkami. [DDT and α-BHC content in blood and fatty tissue of subjects not professionally exposed to these compounds.]** *Pol. Tyg. Lek. 28(51): 1999-2001; 1973.* (12 references) (Polish)

The content of DDT, *p,p'*-DDE, *p,p'*-DDD (TDE), and γ-BHC was determined by gas chromatography in 35 samples of blood and 35 samples of fatty tissue from 3 women and 12 men not occupationally exposed to these compounds. Residues of DDT and *p,p'*-DDE were found in all samples of blood and fatty tissue, *p,p'*-DDD in only 6 samples of fatty tissue (mean 0.14 ± 0.07 mg/kg tissue). Gamma-BHC (lindane) was detected in 19 samples of blood (mean 0.084 ± 0.004 mg/l), and 17 samples of fatty tissue (0.008 ± 0.0002). In fatty tissue the total content of DDT (mean 5.23 ± 0.62 mg/kg) and its metabolites as well as the percentage of *p,p'*-DDT (31.64 ± 2.15%) was lower in this study (1972) than in a similar study in 1967 (10.02 ± 0.58 mg/kg and 36.56 ± 0.8%). In blood, total DDT (0.030 ± 0.07 mg/l) and percentage *p,p'*-DDT (36.51 ± 5.36%) did not differ markedly from results obtained in 1967 (0.04 ± 0.003 mg/l and 37.82 ± 3.34% respectively.)

75-0050. Dalziel, J.; Duncan, H. J. (Agr. Chem. Sect., Dept. Chem., Univ. Glasgow, Glasgow, Scotland). **Studies on potato sprout suppressants. 1. Residual levels of tecnazene in laboratory-treated and in commercial samples of potatoes.** *Potato Res. 17(2): 215-223; 1974.* (11 references)

A technique for accurate estimation of 0.01 ppm tecnazene in potatoes has been developed using gas chromatography after a preliminary clean-up treatment on an alumina column. Tecnazene at 1 μg/kg fresh weight of potato can be detected with some loss in accuracy. With reference to the potato samples analyzed in the study, all those that had been in contact with tecnazene either in the lab or in commercial storage contained tecnazene residues. A range of tuber pretreatments, including washing copiously with water, peeling, and boiling, did not eliminate the tecnazene contamination; 0.1-1.0 mg/kg remained. Results thus far indicate that levels of tecnazene of the order of 2 to 8 mg/kg fresh weight of tuber are regularly found in treated material. Tecnazene is not confined to the outer layers, but has been translocated to the center of the tuber. Humans eating peeled and boiled samples of treated potatoes would consume an average on the order of 0.5 g/annum in the United Kingdom based on the above figures. Feeding of tecnazene over short periods to rats, mice, and rabbits has had minimal effects. However, the phenol production occurring as a result of tecnazene metabolism must be examined more closely from a toxicological point of view.

75-0051. See, R. M.; Hurtt, W. (Vegetation Control Div., Fort Detrick, Frederick, MD 21701). **The influence of artificial rainfall and Di-1-*p*-menthene on karbutilate movement in greenhouse soil.** *Proc. Northeast. Weed Sci. Soc. 28: 127-132; 1974.* (12 references)

Simulated rainfall was applied to flats of oats (*Avena sativa* L.) growing in greenhouse soil which had previously been treated with combinations of karbutilate and di-1-*p*-menthene (Pinolene, Vapor Gard). Aliquots of the runoff from each treatment were applied to the roots of bean plants (*Phaseolus vulgaris* L. cv. Black Valentine) grown in solution culture as a bioassay for the presence of the herbicide. The growth of the bean plants treated with the runoff water from the Karbutilate + Vapor Gard treatment was significantly less than the growth of plants receiving runoff aliquots from treatments involving karbutilate alone. The dry weight of oats clipped from flats treated with karbutilate was significantly less than the values obtained for the karbutilate + Vapor Gard treatment. The data suggests that Vapor Gard increased rather than decreased the amount of karbutilate in the surface runoff.

75-0052. Bartsch, E. (Agr. Res. Develop. Dept., Ciba-Geigy Ltd., Basel, Switzerland). **Diazinon. II. Residues in plants, soil, and water.** *Residue Rev. 51: 37-68; 1974.* (74 references)

Available data are reviewed on diazinon residues following application at recommended rates in fruits, vegetables, cereals, and forage crops, as well as in soil and water. Residues of 1-5 ppm are found on fruits immediately after treatment; on the average they decreased by 50% in 4 days. Higher initial values and shorter half-lives are measured on leafy vegetables, hops, and forage crops. Residues on other vegetables, cereals, and condiments are low (less than 0.5 ppm seven days after treatment). Degradation of diazinon seems retarded in crops with high oil content. An average of 3 ppm diazinon is found in the soil immediately after treatment. The soil half-life is 2-4 weeks. The rate of degradation is influenced by the nature of the soil and climatic conditions. Diazinon is degraded in plants mainly by hydrolysis of the thiophosphorus ester and subsequent side-chain hydroxylation of the resulting 2-isopropyl-4-methyl-6-hydroxypyrimidine. Only traces of diazinon, the oxygen analog of diazinon, are ascertained in pome fruits, vegetables, rice, and olive oil. Storage and processing of treated fruits and vegetables considerably reduce residues remaining at harvest. (Author abstract by permission, abridged).

75-0053. Dejonckheere, W.; Steurbaut, W.; Kips, R. H. (Lab. de Phytopharmacie, Universite de l'Etat a Gand,

Gand, Belgium). **Residus d'hexachlorobenzene (HCB) et d'insecticides organo-chlores dans les pollard-pellets, les aliments du betail et la graisse animale. [Hexachlorobenzene (HCB) and organochlorine insecticide residues in pollard pellets, cattle feed, and animal feed.]** *Rev. Agr. 27(2): 325-340; 1974.* (14 references) (French)

Results of hexachlorobenzene (HCB) and other organochlorine pesticide residue analyses in pollard pellets, cattle feed, and animal fat are presented. Pollard pellets from Argentina contained HCB and almost always α-BHC, lindane, *p,p'*-DDT, *o,p'*-DDT, and DDD(TDE). The hexachlorobenzene residue levels showed seasonal variations, the highest levels up to 0.70 ppm being observed in the September-January period. The α-BHC, lindane, and *p,p'*-DDT levels were usually higher than the hexachlorobenzene levels. The pentachlorobenzene detected may be an impurity or a metabolite of hexachlorobenzene. Twenty-seven out of 30 cattle feed samples contained hexachlorobenzene and 9 samples had residue levels in excess of the maximum allowable concentration of 0.03 ppm. Concentrations of up to 0.20 ppm of *p,p'*-DDT were found in many samples. All but one of the 25 animal fat samples contained hexachlorobenzene in concentrations ranging from 0.02 to 0.60 ppm. In one sample, 0.07 ppm α-BHC and 0.05 ppm lindane were detected. All samples contained *p,p'*-DDT, *o,p'*-DDT, DDD, and *p,p'*-DDE. The findings indicate transformation of *p,p'*-DDT into DDD and/or *p,p'*-DDE in the animal.

75-0054. Kaiser, K. L. E. (Environment Canada, Canada Centre for Inland Waters, Burlington, Ontario, Canada). **Mirex: An unrecognized contaminant of fishes from Lake Ontario.** *Science 185 (4150): 523-525; 1974.* (15 references)

A perchlorinated, cage-structured hydrocarbon, $C_{10}Cl_{12}$ also known as mirex or Dechlorane, has been identified in fish samples from the Bay of Quinte, Lake Ontario, Canada. The compound coelutes with polychlorinated biphenyls (PCBs) in residue cleanup procedures and under standard gas chromatographic conditions. Mirex has never been registered for use as an insecticide in Canada, nor does it appear to be in use in any area of the United States discharging water into Lake Ontario or its tributaries. It seems likely, therefore, that this compound is another widespread environmental contaminant of extremely high geochemical stability and as yet only superficially investigated biological activities. Under standard gas chromatographic conditions its peak is superimposed on that of the PCBs, and, as a result, the presence of mirex may have been unrecognized and it may therefore have been misinterpreted as a PCB isomer. (Author abstract by permission. Copyright 1974 by the American Association for the Advancement of Science.)

75-0055. Hsu, T. S.; Bartha, R. (Dept. Biochem. Microbiol., Cook Coll., Rutgers Univ., New Brunswick, NJ). **Biodegradation of chloroaniline-humus complexes in soil and in culture solution.** *Soil Sci. 118(3): 213-220; 1974.* (10 references)

Herbicide-derived chloroaniline residues form immobile humic complexes in soil. Studies using soil-bound radiolabeled 3,4-dichloroaniline demonstrate that $^{14}CO_2$ is released from soil at the rate of 1%/week. Varying the pH from 5 to 8 did not alter the rate of $^{14}CO_2$ nor did changing the moisture content between 50 and 70% of the holding capacity. Glucose (30 mg/50 g soil) did not influence $^{14}CO_2$ release. Glucose (250 mg/50 g soil) severely inhibited release of the radiocarbon. Optimum release occurred at 37°C. Sterilized and anaerobic soils released less than 4% of $^{14}CO_2$ as compared to the nonsterile aerobic control. The overall rate of microbial activity, measured by total CO_2 evolution, was not significantly affected by humus-bound 3,4-dichloroaniline. Biodegradation of the humic-3,4-dichloroaniline complex by two soil fungi was studied. *Penicillium frequentans* in two weeks released 7.3 mmol of total CO_2, but only 0.5% of the radiocarbon. This fungus creates humic oligomers with substantial radioactivity still attached. In contrast, *Aspergillus versicolor* released only 4.7 mmol of total CO_2, but as much as 1.3% of the radiocarbon. This fungus mineralizes the aniline rings while still attached to humus, or immediately after their release. From the environmental view, the latter mechanism of attack is more desirable as it precludes the possible contamination of crop plants by 3,4-dichloroaniline residue.

75-0056. Laplanche, A.; Martin, G.; Richard, Y. (Lab. Chim. Eaux et Environ., Ecole Nat. Super. de Chim., Rennes, France). **Ozonation d'une eau polluee par du parathion. [Ozonization of parathion-contaminated water.]** *Tech. Sci. Munic. 69(7): 407-413; 1974.* (14 references) (French)

The efficiency of and factors influencing the destruction of parathion in water by ozonization were studied. The initial parathion concentration was 80 μg/liter. Ozonization was highly effective in the destruction of parathion which was thereby converted to paraoxon and then to other oxidation products. A contact time of at least 12 min and a minimum ozone supply of 3 mg/liter were necessary for the quantitative destruction of parathion. The paraoxon concentration was highest when 90% of the initial parathion had been degraded. Unlike paraoxon, parathion was more readily decomposed in slightly acid water; nevertheless, ozonization should be conducted in slightly basic water to reduce the ozone demand. Final purification by means of activated carbon is essential for removal of the ozonization products from high-quality drinking water.

See also **75-0166** **75-0203**

75-0057. Ott, M. G.; Holder, B. B.; Gordon, H. L. (Dow Chemical Company, Corporate Med. Dept., 2030 Dow Center, Midland, MI 48640). **Respiratory cancer and occupational exposure to arsenicals.** *Arch. Environ. Health 29(5): 250-255; 1974.* (12 references)

The proportionate mortality experience of 173 decedents exposed primarily to lead arsenate and calcium arsenate was compared with that of 1,809 decedents not exposed to those compounds. A significant increase in respiratory cancer was found among the exposed employees. The relationship between cumulative arsenic exposure and the ratio of observed to expected respiratory malignancy deaths was estimated by means of a least squares approach. The predicted ratio was 7:1 for individuals exposed for a period of more than eight years to compounds that contained an equivalent level of 1 mg/m^3 arsenic. In the more heavily exposed individuals, an excess of respiratory cancer was observed 35+ years after the initial exposure. Observations based on the proportionate study were supported by an analysis of the same target population, employing the prospective study in retrospect approach. (Author abstract by permission)

75-0058. Renzoni, A. (Inst. Comparative Anat., Univ. Siena, Italy). **The decline of the grey partridge in Italy.** *Biol. Conserv. 6(3): 213-215; 1974.*

Throughout Europe during the last 30 years the indiscriminate use of pesticides for crop protection and to increase productivity has greatly reduced the variety of natural vegetation with a consequent decline in invertebrate life, especially insects. This has been a significant factor in the decline of the grey partridge in Italy in that both chicks and young partridges need a protein-rich diet as do adult females during the early reproductive period.

75-0059. Haddadin, M. J.; Alawi, A. A. (Basic Med. Sci., Univ. Jordan, Amman, Jordan). **Dead populations of fish in the Rivers Jordan and Zarqa.** *Biol. Conserv. 6(3): 215-216; 1974.*

Large numbers of dead fish appeared in the Rivers Jordan and Zarqa in March of 1973 and were thought to have been killed by insecticides, as the spraying of many crops takes place at this time of year. Analytical studies were made on water samples and four genera of fish represented in the kill: carp, *Telapia, Clarias*, and *Barbus*. An organophosphorus pesticide, parathion, was confirmed as the probable toxic agent. It is suggested that the fish probably absorbed the insecticide in the form of a fine suspension rather than in solution. Farmers were instructed to exercise greater care in the use of their pesticides.

75-0060. Bourne, W. R. P.; Smith, A. J. M. (Dept. Zool., Univ. Aberdeen, Aberdeen, Scotland). **Threats to Scottish sandwich terns.** *Biol. Conserv. 6(3): 222-224; 1974.* (3 references)

Following pollution with effluent discharged from a pesticide factory into the Rhine, the number of sandwich tern in Holland dropped from 40,000 pairs in 1957 to 650 pairs in 1965. Control measures have allowed a population increase to 2,000 pairs, but still the overall population of the birds is considerably decreased. A large increase in numbers of sandwich terns had been reported at a more efficiently protected site in Northumberland, north-east England. The welfare of these northern colonies had been of particular interest because they were comparatively safe from the organochlorine pollutants which affected more southerly colonies in recent years. However, due to increased numbers of human intruders and growing fox habitation in that area, the birds are once again dropping in number.

75-0061. Tadjer, G. S.; Egyed, M. N. (Leopold Greenberg Inst. Forensic Med., Hebrew Univ., Jaffa, Abu Kabir, Israel). **Detection of Cyolane in alfalfa pellets and rumen content of a cow.** *Bull. Environ. Contam. Toxicol. 12(2): 173-176; 1974.* (10 references)

Alfalfa pellets and the rumen contents of a fatally poisoned cow which might have ingested Cyolane (phospholan)-contaminated alfalfa were analyzed by thin-layer chromatography, gas-liquid chromatography, and colorimetry. The alfalfa and rumen contents contained 1.26 and 0.3 ppm Cyolane, respectively. No Cyolane was detected in alfalfa pellets and rumen contents of cows with no known history of Cyolane contamination. It is possible that the apparently high toxicity of this compound is not directly related to the small amounts of Cyolane which were found on analysis, but is instead related to a relatively large amount of a metabolite which is a potent cholinesterase inhibitor, but which is not easily detectable using the methods of analysis employed.

75-0062. Lincer, J. L.; McDuffie, B. (Mote Marine Lab., Sarasota, FL 33581). **Heavy metal residues in the eggs of wild American kestrels (*Falco sparveritus* Linn).** *Bull. Environ. Contam. Toxicol. 12(2): 227-232; 1974.* (23 references)

Wild American kestrel eggs were collected from Ithaca, New York 5 days after the last egg of the clutch was laid. Analyses for heavy metals using atomic absorption techniques were carried out. The heavy metal content was, in general, relatively low, with the levels of organochlorine insecticides and PCBs being appreciably higher. The average Ratcliffe's Index (of eggshell thickness) was .917. There were no obvious correlations between eggshell thickness and mercury, copper, or lead content. The biological significance of the observed heavy metal concentrations is difficult to assess.

75-0063. Finley, E. L; Metcalfe, G. I.; McDermott, F. G.; Graves, J. B.; Schilling, P. E.; Bonner, F. L. (Sch. Home Economics, Louisiana State Univ., Baton Rouge, LA 70803). **Efficacy of home laundering in removal of DDT, methyl parathion, and toxaphene residues from contaminated fabrics.** *Bull. Environ. Contam. Toxicol. 12(3): 268-274; 1974.* (8 references)

One all-cotton fabric and a separate cotton-polyester fabric in a 50/50% fiber blend were used to test the effects of a series of washings on residues of methyl parathion and a mixture of toxaphene-DDT-methyl parathion. Washing greatly reduced the residues in each fabric, with no difference between the two being noted. Methyl parathion applied alone was much more easily removed than when applied in the mixture. Both toxaphene and DDT residues were very difficult to remove from the 2 fabrics after the initial washing. Residues of the 3 insecticides were transferred to uncontaminated cotton and cotton-polyester fabrics when these were washed with cotton and cotton-polyester contaminated fabrics. When methyl parathion was applied alone the residue level transferred to the cotton and cotton-polyester clean fabrics was the same, about 10% of that in the contaminated fabrics. However, transfer to cotton-polyester fabric was greatly enhanced by the presence of toxaphene and DDT. Methyl parathion residues extracted from the cotton-polyester transfer fabric were 50% of these detected in the contaminated fabric. Residues of toxaphene and DDT in the cotton-polyester transfer fabric were about 67% those in the contaminated fabric; however, residues in the cotton transfer fabrics were only about 2.5% of those in the contaminated fabrics. Before and after each of the 3 washings, all flies confined on either fabric contaminated with toxaphene-DDT-methyl parathion were killed in 24 hr.

75-0064. Senewiratne, B.; Thambipillai, S.; Williams, E.; Pooranampillae, V. (Dept. Med., Univ. Ceylon, Kandy, Sri Lanka). **Poisoning: a two year study.** *Ceylon Ass. Advan. Sci. Proc. Annu. Sess. 28 (1): 14; 1972.*

Of 472 cases of poisoning admitted to the Kandy Hospital during 1970-1971, insecticides were responsible for 44.2%. Of the 472 victims, 112 (23.7%) died; insecticides were responsible for 66.9% of these fatalities. The most commonly ingested poisons in both the accidental and suicidal cases were insecticides, accounting for 28.2% and 47.9%, respectively. The rapidity with which death follows ingestion of insecticides in some cases makes treatment difficult. It is suggested that a special unit dealing with poisonings be established at this hospital.

75-0065. Spynu, Ye. I.; Molozhanova, Ye. G.; Stefanskiy, K. S. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Obosnovaniye gigiyenicheskikh normativov soderzhaniya ryada pestitsidov v pochve. [Substantiation of hygienic standards for pesticidal compounds in soil.]** *Gig. Sanit. 39(7): 75-79; 1974.* (12 references) (Russian)

The maximum allowable concentration of a pesticide in soil can be determined indirectly based on the concentration occurring in media in contact with the soil, i.e., water, air, and plants, due to migration. If the pesticide concentrations in these media have no negative effects on humans or on the general sanitary characteristics of the soil, the maximum allowable concentration has not been exceeded. The maximum allowable concentrations of BHC, lindane, polychloropinene, toxaphene, carbaryl, and DDT in soil were examined on the basis of this principle. The rate of migration and accumulation of pesticides from soil was highest for plants in general and carrots in particular; therefore, the latter species was selected as indicator. The permissible pesticide concentrations determined using the migration criterion are 0.05 mg/kg for carbaryl; 0.5 mg/kg for polychloropinene and toxaphene; and 1 mg/kg for DDT, lindane, and BHC.

75-0066. Merenyuk, G. V. (Moldavian Sci. Res. Inst. Hyg. Epidemiol., Kishinev, USSR). **Sanitarno-mikrobiologicheskiye kriterii dlya ustanovleniya predel'no dopustimogo soderzhaniya vrednykh khimicheskikh veshchestv v pochve. [Sanitary-microbiological criteria for establishing permissible limits for the concentration of harmful chemicals in soil.]** *Gig. Sanit. 39(7): 79-81; 1974.* (8 references) (Russian)

Problems of establishing permissible limits for the concentrations of harmful chemicals in general and especially of pesticides in soil are presented with respect to sanitary-microbiological criteria. Pesticides present in the soil may affect the spontaneous self-purification process, i.e., the destruction of organic matter and pathogenic microorganisms, depending on such factors as the type of soil, the activity of microbiological processes, and the biological characteristics of the pathogens. Pesticides usually have species-specific effects on microorganisms, stimulating or suppressing specific native or pathogenic microbes. Therefore, the maximum permissible pesticide concentration in soil should be standardized with respect to the effect of the pesticides on beneficial and pathogenic microorganisms, and on the self-purification process as a whole. Pesticides such as cuprosan and DNOC inhibit many pathogenic bacteria, but also interfere with nitrifying and cellulolytic bacteria, thus reducing the nitrate and ammonia levels in the soil.

75-0067. Angle, C. R.; Wermers, J. (Omaha, NB 61805). **Human poisoning with flea-dip concentrate.** *J. Amer. Vet. Med. Ass. 165(2): 174-175; 1974.* (4 references)

A 5 yr old boy was mistakenly given 3/4 tsp of flea dip which consisted of 21% delnav (2,3-dioxane, dithiol-*S*,*S*-bis-*O*,*O*-diethylphosphorodithioate), 9%

related products, and 60% methylated naphthalenes. Vomiting occurred within 30 seconds after ingestion. Emergency room treatment with ipecac produced vomiting and profuse diarrhea. The boy became obtunded, suffered generalized muscle weakness, and had shallow, rapid respirations, muscle fasciculations, tearing, and miosis within 2 hr of ingestion. Serum pseudocholinesterase activity was less than 10% of normal. Muscle weakness and cholinergic stimulation subsided by 12 hr and supportive and antidotal treatment including atropine and pralidoxime aided improvement. Mild chemical pneumonitis developed but resolved by day 5. The flea dip had been dispensed by the veterinarian in a bottle which was mistaken for a bottle of prescription cough medicine by both the boy and his mother. It is suggested that, had the poison been in a bottle with a safety lock, the added time required to open the bottle might have occasioned a glance at the label.

75-0068. Nicholson, S. S. (Baton Rouge, LA 70803). **Bovine posterior paralysis due to organophosphate poisoning.** *J. Amer. Vet. Med. Ass. 165(3): 280-281; 1974.* (1 reference)

Several animals in a 42-cow herd of crossbred beef cattle were diagnosed as having toxic neuropathy. The affected animals maintained their appetite, were alert, could see and hear, and were able to defecate. Illness developed as mild posterior weakness, progressing over 2 days to 2 weeks to flaccid irreversible paralysis of the hindlimbs. A crouched stance with partial flexion of the stifles and hocks and a slightly arched back were noted. A partially raised tail and persistent dribbling of urine were observed. The cause of this illness was traced to molasses being fed to the herd. The molasses had been stored in 55-gallon barrels obtained from a nearby pipeline pump station which had previously been used for storing hydraulic fluid. The hydraulic fluid contained tri-*o*-cresyl phosphate, an organophosphorus compound known to cause delayed neuropathy involving the spinal cord.

75-0069. Gaultier, M.; Gervais, P.; Conso, F. (Clinique Toxicologique, Hopital Fernand-Widal, Paris, France). **Intoxication aigue par le dinitroorthocresol. [Acute poisoning by dinitroorthocresol.]** *J. Eur. Toxicol. 7(1): 9-11; 1974.* (7 references) (French)

One fatal and two non-fatal cases of acute poisoning by DNOC in dyeworks due to inhalation and skin contact are discussed. Respiratory difficulties, perspiration, tachycardia, hypertension, pronounced generalized hyperthermia, renal insufficiency with azotemia, hepatocytolysis, and increased alkaline phosphatase level were observed. DNOC, being a true metabolic poison, is responsible for endogenous hyperthermia and hepatic and renal lesions due to cytolysis. The first manifestations of the poisoning usually appear after several days. The effect of DNOC is potentiated by high ambient temperature and the use of alcohol. The oral lethal dose of DNOC ranged from 1 to 3 g in humans.

75-0070. Chen, W. Y.; Hsieh, B. S.; Yen, T. S.; Cheng, J. T. (Nat. Taiwan Univ., Coll. Med., Dept. Intern. Med., Taipei, Taiwan). **Studies on acute drug poisoning.** *Tai-Wan I Hsueh Hui Tsa Chih (J. Formosan Med. Ass.) 72: 386-393; 1973.* (19 references)

Of 6,679 patients admitted to the National Taiwan University Hospital during the years 1954 through 1972 with acute drug poisoning, 370 males and 334 females had ingested insecticides (21.6%), and 224 males and 336 females had ingested rodenticides (16.6%). Insecticides used included organophosphates, DDT, BHC, and derris. Of various rodenticides, the main agents used were fluorides, warfarin, arsenic, and phosphorus. The largest number of cases fell into the age bracket of from 20-29 yr, with those aged 30-39 yr ranked next, followed by those under 19 yr of age. A definite increase in the number of insecticidal poisonings occurred in the months of May and June with a low point occurring during the winter. Most patients came from urban areas in the cases of rodenticide posioning. However, almost equal numbers of cases from urban and rural areas were recorded in cases in insecticide ingestion. Of the total 6,679 cases suffering from drug poisoning, the overall mortality rate was 2.6%, or 179 patients. With adolescents and adults, suicide attempts were the most common cause of acute drug intoxication, although it is noted that accidental farm and industrial poisonings are prevalent among adults.

75-0071. Zavon, M. R. (Dept. Health, Cincinnati, OH). **Poisoning from pesticides: diagnosis and treatment.** *Pediatrics 54(3): 332-336; 1974.* (8 references)

To determine the proper course of action for pesticide poisoning, it is almost useless to know only that the offending agent was a pesticide. The doctor must know at least the chemical class to which the compound belongs, and it is most helpful to know the actual name. At least three criteria must be met to justify a diagnosis of pesticide poisoning. There must be a history of exposure or a reasonable possibility of same. The onset of illness must be within 12 hr of the last exposure. And, finally, a clinical picture consistent with that for the particular chemical involved must be apparent. If these criteria are not met, the diagnosis may be masking a situation which could be treated effectively by other means. In cases of organophosphorus insecticide poisoning, blood samples should be drawn for plasma and erythrocyte cholinesterase determinaton. Treatment should then be started, but if the value for cholinesterase is not less than 50% of the normal value, the diagnosis of organophosphorus intoxication should be suspect. The serum cholinesterase concentration is frequtnly depressed for reasons other than inhibition by an

organophosphorus compound and therefore the erythrocyte cholinesterase determination is preferred. In organophosphorus poisoning one should maintain a clear airway, administer atropine sulfate (10 to 12 mg, total dose), and administer pralidoxime chloride (100 to 140 mg/kg) only after atropine and if needed. It is essential to know how the pesticide is diluted for treatment to be correct, as in cases where a petroleum-based solvent is used, emesis should be avoided due to risk of chemical pneumonitis. Failure to provide adequate oxygenation during treatment has caused permanent brain damage from pesticide intoxication.

75-0072. Ramanauskayte, M. B.; Baublis, P. P. (Municipal Hospital and Clinics, Vilnyus, USSR). **Klinika i lecheniye otravleniy rtut'organicheskimi yadokhimikatami u detey. [Clinical picture and treatment of organomercurial pesticide poisoning in children.]** *Pediatriya Moscow 35(2): 56-60; 1973.* (25 references) (Russian)

The clinical picture and the treatment of acute and chronic poisoning by organomercurial pesticides like granosan in children are described on the basis of a comprehensive clinical material. The acute poisonings were due mostly to handling of granosan or the ingestion of granosan-treated seeds. Intrauterine poisoning in infants was observed. While children on the whole are more susceptible to mercury than adults, the clinical picture of the poisoning was a function of age. Serious functional disorders of the central nervous system, hydrocephalus, cerebral paralysis, and spasms were observed in infants. Toxic encephalomyeloradiculoneuritis with prevalence of the syndromes of lesions of the cerebral cortex, brain stem, cerebellum, myelitis, peripheral neurites, lesions of the motor centers, of the pyramidal tracts, and encephalitis with irregular alpha-rhythm were observed in older children. Epilepsy lasting up to 2 years was observed in 10% of all cases. Prevalence of vegetoneurotic syndromes, tachycardia, bradycardia, arrhythmia, acrocyanosis, lability of the arterial pressure, and reduction of the blood cholinesterase activity were found in older children with chronic poisoning. The lesions of the liver, kidney, heart and gastrointestinal tract were much less pronounced than those of the central nervous system. Sodium thiosulfate, glutamic acid, vitamin B and C complex, glucose, and diuresis are essential for detoxication.

74-0073. Muthu, M.; Krishnamurthy, T. S.; Majumder, S. K. (Central Food Technol. Res. Inst., Mysore 570013, India). **An evaluation of impregnated respirator canister carbons for phosphine removal from air.** *Pestic. Sci. 5(3): 245-249; 1974.* (17 references)

The following gas mask canister carbon fillings were evaluated in laboratory and man tests against phosphine which is finding favor as a fumigant for food stuffs: activated carbons impregnated with (1) copper sulfate, (2) potassium dichromate and silver chromate, (3) copper carbonate, potassium chromate and silver chromate and (4) potassium permanganate. Impregnation with copper sulfate (12% w/w) proved to be effective and economical. A cumulative service time of 5.2 mg h/liter was obtained in the laboratory tests at 1.7 mg/liter phosphine in air and 3.1 mg h/liter at 0.2–1.5 mg/liter phosphine in the man tests. (Author abstract by permission)

75-0074. Kontek, M.; Paradowski, S. (Cardiol. Clinic, Inst. Intern. Diseases, Med. Acad., Poznan, Poland). **Profilaktyka, rozpoznawanie i leczenie zatruc pestycydami, pochodnych zwiazkow fosfoorganicznych i karbaminianowych. [Prevention, diagnosis and treatment of poisoning with pesticides, derivatives of organophosphorus compounds and carbamates.]** *Pol. Tyg. Lek. 29(8): 333-335; 1974.* (13 references) (Polish)

Long term neurotoxic effects and symptoms of acute intoxication with organophosphorus compounds and carbamates are briefly reviewed. The importance of taking preventive measures and work hygiene is stressed. The effect on cholinesterases is briefly discussed and electrometric and colorimetric determinations of cholinesterase activity in plasma and blood cells is described. It is suggested that agricultural workers be tested for cholinesterase activity and those with reduced activity due to inherited enzymopathy, liver disease, or early stages of cardiac infarction be screened out. Acute poisoning with organophosphorus pesticides should be treated with atropine (1-2 mg i.m. or, in severe cases, 2-4 mg i.v. every 10-30 min with a possible total of 80 mg in 24 hours), pralidoxime (i.v. infusion 0.5 g per hour), or obidoxime (0.1-0.25 g up to 8 times a day). Morphine, aminophylline, and theophylline should be avoided. In cases of carbamate poisoning pralidoxime should not be administered.

75-0075. Ritty, P. M. (Dow Chem. Co., Shawnee Mission, KS). **Some industrial disposal methods of pesticides by-products.** *Proc. N. Cent. Br. Entomol. Soc. Amer. 28: 183-184; 1974.*

The correct disposal of pesticide waste by-products is essential to the safe use of pesticides. If air, soil, and water contamination is to be avoided, used containers as well as the pesticide remnants from spills or surplus spray mixtures must be handled properly to insure protection of the environment. Various methods of handling types of waste occurring during pesticide production and use are discussed. Natural biodegradation, the oldest type of pesticide waste disposal, appears to be less effective than some chemical and physical methods. Accelerated biological degradation, incineration, chemical treatment, and physical handling of disposal components of insecticides as used by industry on a large scale are considered. Application of the techniques used by industry are related to the farmer-user

with specific suggestions for proper handling of pesticide remnants. Some recycling suggestions are offered.

75-0076. Ryan, S. O. (Iowa State Univ., Ames, IA 50010). **Considerations for disposal of unwanted pesticides and empty pesticide containers.** *Proc. N. Cent. Br. Entomol. Soc. Amer. 28: 184-185; 1973.*

Due to the highly toxic nature and longevity of some insecticides, herbicides, and fungicides, safe disposal of unwanted portions is a problem. This problem concerns not only disposal of the actual chemicals, but the empty pesticide containers as well. There are few satisfactory methods of handling this problem either on the level of the individual user or at the university level. It is suggested that the first step in establishing a safe and efficient disposal system is to obtain information to define the total disposal system as it presently exists. A mailed questionnaire survey technique could serve this purpose well. One particular problem in the past has been the disposal of several pounds of a given chemical which had been shipped to a university for specific testing or analysis. In many cases a few ounces of the material would have been sufficient for the testing. It is suggested that industry may be ready to absorb the cost of preparing smaller samples for this purpose.

75-0077. Egyed, M. N.; Malkinson, M.; Eilat, A.; Shlosberg, A. (Kimron Vet. Inst., Bet Dagan, Israel). **Basudin (diazinon) poisoning in goslings.** *Refuah Vet. 31(1): 22-26; 1974.* (19 references)

Twenty 2-3 week old goslings experienced fatal diazinon poisoning when placed in a small room which had been sprayed for fly control 2 days earlier with a Basudin 25 emulsion in water equivalent to 0.3% diazinon. The bedding in the room was removed, the floor washed, and the room unoccupied for 2 weeks. A second group of goslings was introduced at this time, and showed milder but similar symptoms. Clinical symptoms, toxicological analysis, and depressed cholinesterase values all indicated diazinon poisoning. The oral LD50 of diazinon for these birds was determined experimentally to be approximately 2.75 mg/kg. This indicates that goslings are more susceptible to diazinon poisoning than are chicks, ducklings, or turkeys. Studies revealed that the depression of cholinesterase in the whole blood and plasma of goslings exposed to different dose levels of diazinon was of similar orders of magnitude, and thus independent of the dosage level of the insecticide. The walls of the room in which the goslings were placed were rendered with lime which apparently held the diazinon in an active state for 2 weeks. The goslings were seen to peck the walls and apparently ingested enough diazinon to induce intoxication.

75-0078. Henrich, M.; Semmler, F. (Zentrum fuer Chirurgie der Universitaet, Frankfurt am Main, Germany). **Paradoxe klinische Symptomatik einer E 605-Intoxikation. [Paradoxical clinical symptomatics of E 605 (parathion) intoxication.]** *Ther. Gegenw. 112(12): 1946-1949; 1973.* (2 references) (German)

Paradoxical clinical symptoms developed in a suicide attempt by a 16-year-old male patient who ingested E 605 (parathion). Maximum degree of mydriasis without light reaction, tachycardia, hypertension, hypersalivation, dyspnea, and sharp abdominal pains were determined. Atropinization and Toxogonin (obidoxime) therapy resulted in rapid suppression of the poisoning symptoms. Metabolites of E 605 were detected in the gastric contents. The findings corroborate other observations of the occurrence of mdriasis ans an exception to the rule in poisonings by organophosphorus substances.

See also **75-0203** **75-0204**

75-0079. Tyunyayeva, G. N.; Minenko, A. K.; Pen'kov, L. A. (Sci. Res. Inst. Agr. of Central Regions of the Non-Chernozem Zone, Nemchinovka, USSR). **Vliyaniye treflana na biologicheskiye svoystva pochvy. [Effects of treflan on biological activity of soil.]** *Agrokhimiya 6: 110-114; 1974.* (8 references) (Russian)

The effect of normal and increased doses of trifluralin on soil microorganisms and on the soil biochemical activity was studied in moist meadow soil and peaty humus. At an expenditure of 3 kg/ha, trifluralin did not cause essential changes in the bacteria, actinomycetes, fungus, ammonifying and phosphorus-mineralizing microorganism counts, or in the soil biochemical activity. The reduction in the bacteria count was pronounced in both soils, and reduction of the urease activity and the nitrifying capacity were observed in the moist meadow soil. The effect of trifluralin appeared first after two weeks in both types of soil. An increase in the expenditure from 3 to 9 kg/ha did not change the growth and activity of the microflora. A tenfold dose caused only slight increases in the moderately pronounced toxicity.

75-0080. Needham, P. H.; Stevenson, J. H. (Rothamsted Exp. Sta., Harpenden, Hertfordshire, Great Britain). **The toxicity to foraging honeybees, *Apis mellifera*, of endosulfan, malathion and azinphos-methyl applied to flowering oil seed rape, *Brassica napus*.** *Ann. Appl. Biol. 75(2): 235-240; 1973.* (15 references)

Wettable powder and emulsifiable concentrate formulations of endosulfan and azinphosmethyl and an emulsifiable concentrate of malathion were sprayed at normal agricultural application rates on oil seed rape in full flower to assess relative toxicities to foraging honeybees. The results indicated that endosulfan at the applied rate is much safer to honeybees than azinphosmethyl or malathion applied at the recommended rates. The data also indicates that the two emulsifiable concentrates may have been safer than the wettable powders, although this seems to be less important than the choice of chemical. The cholinesterase activity of the bees exposed to the endosulfan-treated plants was normal; it was low in the bees exposed to the azinphosmethyl-treated plants and very low in those exposed to the malathion-treated plants.

75-0081. Maksimovic, M.; Cosic, M.; Binenfeld, Z. (Inst. Tech. Med. Protection, Belgrade, Yugoslavia). **Aromatic phosphoryl thiocholines. III. The kinetics of inhibition of purified horse serum cholinesterase.** *Arh. Hig. Rada Toksikol. 24(2): 117-126; 1973.* (16 references)

The kinetics and thermodynamics of purified horse serum cholinesterase inhibition by seven *O*-ethyl-*S*-[(2-*N*-methyl-*N*-arylamino)ethyl] methylthiophosphonates and seven *O*-ethyl-*S*-[(2-*N*-methyl-*N*-arylammonium)ethyl] methylthiophosphonate methosulfates were studied. The results of the studies indicated that the influence of benzene ring substituents is more important in tertiary than in analogous quaternary groups of inhibitors. Although the results of *ki*, *E*, and log *A* are not entirely identical, they show that quaternization is of major importance in activation of this type of serum cholinesterase inhibitor. Regarding the steric factor, the position of benzene ring substituents is more important than is the kind of substituent.

75-0082. Simeon, V.; Reiner, E. (Inst. Med. Res., Yugoslav Acad. Sci. Arts, Zagreb, Yugoslavia). **Comparison between inhibition of acetylcholinesterase and cholinesterase by some *N*-methyl- and *N,N*-dimethylcarbamates.** *Arh. Hig. Rada Toksikol. 24: 199-206; 1973.* (21 references)

The second order rate constants for inhibition (*k*a) of various sources of acetylcholinesterase and cholinesterase with seven *N*-methyl- and 2 *N,N*-dimethylcarbamates are presented in tabular form. A comparison between acetylcholinesterase and cholinesterase is given for different stages of the time course of the reaction. At pre-steady state the comparison is based on *k*a values, and at steady state on the *K* values (apparent equilibrium constants for enzyme and inhibitor). When 2 enzymes are inhibited by the same compound, the difference in the degree of inhibition at steady state and pre-steady state will be greater the greater the difference in the stability of the carbamylated enzymes.

74-0083. Plestina, R.; Svetlicic, B. (Inst. Med. Res. Occupational Health, Yugoslav Acad. Sci. Arts, Zagreb, Yugoslavia). **Toxic effects of two carbamate insecticides in dogs.** *Arh. Hig. Rada Toksikol. 24: 217-225; 1973.* (19 references)

Approximately equitoxic doses of propoxur (2-isopropoxyphenyl methylcarbamate) and promecarb (3-methyl-5-isopropylphenyl methyl carbamate) were injected i.v. or i.m. into dogs. No qualitative difference in symptoms was observed after injection of either carbamate i.m. A rapid fall of enzyme activity was noted after i.m. injection of either insecticide with the degree of inhibition being dose dependent. Recovery of enzyme activity, however, was much slower in the case of promecarb. This prolonged inhibition was felt to be due to a much slower absorption of promecarb from the site of injection and can be likened to a delay in the gastrointestinal and/or skin resorption experienced in cases of human occupational exposure. On i.v. injection the quality of symptoms was again similar for each compound and similar to those obtained on i.m. injection. After i.v. injection no difference in the rate of recovery from each compound was noted. Again, the higher the dose the more pronounced was plasma cholinesterase inhibition. With the highest doses, 3.0 mg/kg of propoxur and 1.5 mg/kg of promecarb, cholinesterase was depressed to 25 and 8% of normal, respectively. This inhibition was relatively transient.

75-0084. Schmidt, R. (Math.-Nat. Fakultaet, Martin-Luther-Universitaet, Halle-Wittenberg, DDR). **Zur Wirkung von 1,1,1-Trichlor-2,2-bis (*p*-chlorophenyl)-aethan (DDT) auf die Praenatalentwicklung der Hausmaus (unter Beruecksichtigung des transplazentaren Transports und Metabolismus von 3H- und 14C-markiertem DDT in graviden Maeusen). [Effect of 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)-ethane (DDT) on the prenatal development of the mouse (under consideration of distribution of tritium-labeled and carbon-14-labeled DDT in pregnant mice).]** *Biol. Rundsch. 11(5): 316-317; 1973.* (German)

The effects of tritiated and ^{14}C-labeled DDT on prenatal development in mice were studied under various conditions. More or less dose-dependent blastotoxic, embryotoxic and fetotoxic effects of DDT following single or repeated application were established. The minimum embryotoxic dose was 25 mg/kg administered 10 days post copulation; daily 2.5 mg/kg doses were significantly embryotoxic. DDT accumulation in the fetal organism during prolonged administration led to fetal deaths. Prolonged exposure to DDT prior to copulation caused preimplantational and postimplantational losses due to embryotoxic and hormonal mechanisms. Withdrawal of food for 48 hr after prolonged administration of DDT caused increased postimplantational losses, retarded growth, and mobilization of the maternal DDT depots from the adipose tissue into the fetal organism. Most of the DDT accumulated in the adipose tissue and in the liver, the site of metabolism, where DDE, DDD, DDOH, and DCB were also detected. The presence of non-metabolized DDT in the fetal organism is indicative of the absence of a placental barrier in mice.

75-0085. Tjalve, H. (Dept. Toxicol., Univ. Uppsala, Sweden). **Accumulation of labelled aminotriazole in some transplanted tumours in mice.** *Brit. J. Cancer 30(2): 136-141; 1974.* (21 references)

The distribution of aminotriazole (amitrole) in rapidly growing tumor tissues was studied in mice using three types of tumors: spontaneous mammary carcinoma, methylcholanthrene induced fibrosarcoma, and moloney-virus induced lymphoma. Tumors were transplanted s.c. in the dorsal region of the neck in mice of the respective strains. A high accumulation of radioactivity was observed in all tumors at the survival intervals from 1 hr to 5 days after injection of ^{14}C-aminotriazole. Radioactivity was most pronounced in the actively growing parts of the neoplasms, and practically no uptake was seen in the necrotic areas of the tumors. Uptake was higher in the mammary carcinoma and the fibrosarcoma than in the lymphoma. Radioactivity remained at higher relative concentrations in the tumors than in other tissues. Tissues which accumulated much radioactivity included the spleen (red pulp and germinal centers), bone marrow, thymus (cortex), lymph nodes (germinal centers), liver (perilobular parts), mucosa of the gastrointestinal tract, kidneys, and urinary bladder. Indications that the aminotriazole is present in the cytoplasm of the cells without being attached to any of the particulate cell fractions supports the suggestion of an interference by the herbicide in an early stage of the nucleic acid synthesis, possibly purine synthesis.

75-0086. Stonard, M. D. (Biochem. Mech. Sect., M.R.C. Toxicol. Unit, Med. Res. Counc. Lab., Carlshalton, Surrey, Great Britain) **Experimental hepatic porphyria induced by hexachlorobenzene as a model for human symptomatic porphyria.** *Brit. J. Haematol. 27(4): 617-625; 1974.* (27 references)

Male and female Porton strain rats were maintained on diets containing 0.2% w/w hexachlorobenzene (HCB). The levels of cytochrome P-450 were measured in the liver microsomes as were the HCB and porphyrin concentrations in the liver homogenate. Chronic HCB feeding increased the levels of certain hepatic hemoproteins prior to the onset of hepatic porphyria. The onset of this disease was slow, and only water soluble porphyrins accumulated in the livers. The accumulation of HCB by the liver was progressive, but no direct correlation existed between the amount of HCB in the liver, the extent of hepatic porphyria, and the changes in hemoprotein concentration. Similarities between the experimental hepatic porphyria induced by HCB and human symptomatic porphyria include: the pattern of porphyrin excretion and the accumulation of water soluble porphyrins in the liver; the modest elevation of the rate-limiting enzyme for heme biosynthesis, δ-aminolaevulinate synthetase; and the elevation of the cytochrome P-450 concentration in the liver. Thus, HCB-induced hepatic porphyria is a useful model for the study of human symptomatic porphyria.

75-0087. Braham, H. W.; Neal, C. M. (Dept. Zool., Coll. Biol. Sci., Ohio State Univ., Columbus, OH 43210). **The effects of DDT on energetics of the short-tailed shrew, *Blarina brevicauda*.** *Bull. Environ. Contam. Toxicol. 12(1): 32-37; 1974.* (13 references)

Since the standard metabolic rate of the short-tailed shrew is twice as high as could be predicted on the basis of weight, any increase in metabolic rate due to DDT is particularly significant. Ten male short-tailed shrews were trapped in Sherman live-traps and acclimated in individual lab cages for one week. Five shrews were fed 10-12 g daily of earthworms collected from an area sprayed nearly 4 years earlier with ^{36}ClDDT. Control animals were fed worms from a commercial bait store. Shrew liver and fat and whole earthworms were analyzed for DDT and metabolites. Oxygen consumption was measured on animals fasted for 2 hours before DDT administration and weekly thereafter. Average DDT levels in shrew liver, fat, and earthworms four weeks after initiation of experiment

were 7.59, 14.70, and 16.55 ppm. No DDT was detected in control shrews or worms. Mean weights of experimental and control shrews increased significantly, and there was no significant difference between experimental and control shrew liver and testes weights. The metabolic rate of experimental animals was significantly higher than that of controls after the first week of DDT administration, but not after the second or third week. Metabolic rate of two experimental shrews fasted for 18 hours increased by 12.3%, while that of fasted controls decreased by 8.3%.

75-0088. Norris, L. A.; Miller, R. A. (Pacific Northwest Forest and Range Exp. Sta., Forest Serv., U.S. Dept. Agr., Corvallis, OR 97331). **The toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in guppies (*Poecilia reticulatus* Peters).** *Bull. Environ. Contam. Toxicol. 12(1): 76-80; 1974.* (18 references)

2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) is a contaminant of commercially produced 2,4,5-trichlorophenoxyacetic acid. Twenty to twenty-five guppies were placed in each 1-gallon glass jar and exposed to 0, 0.1, 1.0, or 10 ppb TCDD, concentrations higher than those expected to occur in forest streams. After 120 hours of exposure, all guppies died, some during exposure, but most died after they were placed in clean water. All treated fish had died within 37 days after the beginning of exposure. Mean survival times (adjusted for fish length) were 21.9, 13.7, and 17.0 days for 0.1, 1.0, and 10.0 ppb TCDD respectively. The apparent decrease in toxicity between 1.0 and 10.0 ppb TCDD may have been related to TCDD solubility. Smaller fish were considerably more sensitive to TCDD than larger fish.

75-0089. Schoor, W. P. (U.S. Environ. Protect. Agency, Gulf Breeze Environment Res. Lab., Sabine Island, Gulf Breeze, FL 32561). **Accumulation of mirex-^{14}C in the adult blue crab (*Callinectes sapidus*).** *Bull. Environ. Contam. Toxicol. 12(2): 136-137; 1974.* (3 references)

Adult blue crabs (*Callinectes sapidus*) were exposed to mirex-^{14}C having a specific activity of 6.34 mCi/mM in a final concentration of 0.05-0.25 ppb. Exposure time ranged from 15 minutes to 16 hours. The uptake of pesticide from solutions containing 0.22 ppb mirex-^{14}C was: hemolymph serum, 0.24-0.69 μg/l; muscle, 0.65-1.1 μg/kg; brain and thoracic ganglion, 0.75-19 μg/kg); and hepatopancreas, 1.6-31.0 μg/kg. There was no difference in uptake between male and female crabs. Response to the toxicant usually progressed through increased aggressiveness to decreased aggressiveness; this was generally followed by loss of equilibrium and death, although some crabs recovered. The data suggests that mirex-^{14}C is absorbed through the gills.

75-0090. El Zorgani, G. A.; Omer, M. E. H. (Agr. Res. Corp., Wad Medani, Sudan). **Metabolism of endosulfan isomers by *Aspergillus niger*.** *Bull. Environ. Contam. Toxicol. 12(2): 182-185; 1974.* (7 references)

Technical α-endosulfan and β-endosulfan (1 ppm) were applied to flasks containing cultures of the mold *Aspergillus niger* Van Tiegh. Endosulfan alcohol was formed by active colonies treated with either the α- or β-isomer. The unchanged substrates were nearly equally distributed between the mycelia and the medium, indicating extensive mycelial uptake of the substrates. However, all of the alcohol detected was present in the medium. Fungi probably play an important role in the decontamination of environments exposed to endosulfan.

75-0091. Bollag, J. M.; Nash, C. L. (Lab. Soil Microbiol., Dept. Agron., Pennsylvania State Univ., University Park, PA 16802). **Effect of chemical structure of phenylureas and anilines on the denitrification process.** *Bull. Environ. Contam. Toxicol. 12(2): 241-248; 1974.* (9 references)

A gram-negative, rod-like bacterial soil isolate with denitrifying capabilities (Isolate A) was used to study the influence of phenylurea herbicides and anilines on denitrification. Nitrous oxide formation was used to measure the degree to which denitrification occurred. Fenuron, monuron, and metabromuron at concentrations of 50, 100, and 200 ppm had no inhibitory effects on denitrification, whereas chloroxuron, fluometuron, neburon, siduron, linuron, and chlorbromuron significantly depressed denitrification at 50, 100, and 200 ppm. Diuron and metoxuron also suppressed denitrification, but their effect was less pronounced at 50 ppm. In each case where no inhibition of denitrification occurred, the phenylurea contained no or only one halogen substitutent on the aromatic ring. In contrast, N_2O production was considerably reduced in the presence of all compounds doubly substituted with halogens on the aromatic ring. The halogen substituted anilines exerted a similar effect in relation to their molecular structure.

75-0092. Gehring, P. J.; Kramer, C. G.; Schwetz, B. A.; Rose, J. Q.; Rowe, V. K.; Zimmer, J. S. (Dow Chemical Company, Midland, MI). **The fate of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) following oral administration to man.** *Toxicol. Appl. Pharmacol. 25(3): 441; 1973.*

Five human male volunteers ingested a single dose of 5 mg/kg 2,4,5-T without presenting detectable clinical effects. Concentrations of 2,4,5-T in plasma and its excretion were measured at intervals after ingestion. The clearances from the plasma, as well as the body, occurred via apparent first order rate processes with half-lives of 23.1 and 29.7 h respectively. Essentially all of the 2,4,5-T was absorbed into the body and excreted

unchanged via the urine. In the body, 65% of the 2,4,5-T resided in the plasma where 98.7% was bound reversibly to protein. The volume of distribution was 0.097 liter/kg. Utilizing the kinetic constants from the single dose experiment, the expected concentrations of 2,4,5-T in the plasma of individuals receiving repeated daily doses of 2,4,5-T were calculated. From these calculations, it was determined that the plasma concentrations would essentially reach a plateau value after 3 days. If the daily dose ingested in mg/kg is A_0 the concentrations in the plasma after attaining plateau would range from 12.7 A_0 to 22.5 A_0 μg/ml. This range would converge to approximately 17 A_0 μg/ml as the daily dose A_0 is distributed throughout the day. (Author abstract by permission) (Papers presented at the Twelfth Annual Meeting of the Society of Toxicology, New York, New York, March 18-22, 1973) (Abstract no. 6)

75-0093. Lloyd, J. W.; Thomas, J. A.; Mawhinney, M. G.; Dieringer, C. S. (Dept. of Pharmacol. and Urol., West Virginia Univ. Med. Center, Morgantown, WV). **Effects of 2,4,5-T and other organochlorines on the metabolism of 1,2,^{3}H testosterone by male organs of reproducution.** *Toxicol. Appl. Pharmacol. 25(3); 441; 1973.*

Male mice treated with varying doses (6.52, 12.5 or 25 mg/kg daily X 10, po) of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) led to a significant reduction in the ability of the prostate gland to assimilate radioactive testosterone (T-H^3), Regardless of the dosage, the average reduction in the uptake of T-H^3 by the prostate gland was about one-third. This treatment period did not cause any significant changes in the relative amounts of T-H^3 metabolites in the prostate, but the absolute amounts of at least three radiosteroids were lowered by this herbicide. The highest dose regimen of 2,4,5-T (viz. 25 mg/kg daily X 10) caused a 33% reduction in the levels of dihydrotestosterone-H^3, a 37% reduction in androstanediol-H^3 and a 14% reduction in prostatic androstenedione-H^3. Acute dose regimens failed to alter the assimilation of labeled testosterone by the mouse prostate gland. The 10-day dose regimen of 2,4,5-T had no significant effect upon the bioconversion of T-H^3 to its radiosteroid metabolites in homogenates of liver. Treatment with 2,4,5-T did not alter either the gravimetric responses of the male sex accessory organs nor did it affect prostate gland fructose levels. Although sex accessory organ H^{3}cAMP and ATP levels were unaffected by the 10-day administration of 2,4,5-T, preliminary data indicate that either dieldrin or DDT can alter these biochemical parameters. (Author abstract by permission) (Abstract no. 7).

75-0094. Berndt, W. O.; Koschier, F. (Dept. of Pharmacol. and Toxicol. and Dept. of Physiol., Dartmouth Med. School, Hanover, NH). **The renal transport of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) in vitro.** *Toxicol. Appl. Pharmacol. 25(3): 441; 1973.*

The herbicides, 2,4-D and 2,4,5-T, are both weak organic acids and might be expected to be transported actively by renal tissue. This proposition has been examined using the tissue slice technic, wherein slice uptake is equated to renal tubular secretion. Both rat and rabbit renal cortical slices were prepared by the free-hand procedure. All incubations were performed at 25°C with 100% oxygen unless otherwise stated. The time-course of accumulation by rabbit tissue was characterized by a rapid initial phase and a slower secondary phase of uptake, although no steady state was reached after 4-5 hr of incubation. Usually 2,4,5-T was accumulated to a greater extent than 2,4-D. For example, at 3 hr the tissue slice:medium distribution ratio (S/M) for 2,4,5-T was 46 and for 2,4-D, 29. The uptake of both compounds was stimulated by acetate, pyruvate, and lactate, and inhibited by succinate. The metabolic inhibitors, 2,4-dinitrophenol and iodoacetamide, decreased uptake by 90%, as did nitrogen. The competitive inhibitor of renal organic acid transport, probenecid, reduced the s/m by 80%. Similar transport characteristics were noted for rat renal cortical slices. In addition a signficant potassium requirement was notedd for the uptake of both acids. These data are interpreted to mean that both herbicides are secreted actively by the mammalian kidney. Such a process may account for the relatively rapid plasma clearance reported in some in vivo studies. (Author abstract by permission) (Abstract no. 8)

75-0095. Dougherty, W.. H: Coulston, F.; Golberg, L. (Albany Med. College, Albany, NY). **Non-teratogenicity of 2,4,5-trichlorophenoxyacetic acid in monkeys (*Macaca mulatta*).** *Toxicol. Appl. Pharmacol. 25(3): 442; 1973.*

Reports that 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) affects embryonic development in various species, mainly rodents, have left unresolved the question of potential hazard to man resulting from exposure to 2,4,5-T containing a minimal amount of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). An answer to this problem was sought by studying the action of 2,4,5-T in the pregnant nonhuman primate *M. mulatta*. Mature female rhesus monkeys were mated with males of proven fertility. Forty pregnant females were assigned to either the control group, or one of the dose-level groups: 0.05, 1.0, and 10.0 mg/kg. Technical Grade 2,4,5-T containing less than 0.05 ppm TCDD was administered in a No. 5 gelatin capsule by stomach tube daily from day 22 through day 38 of pregnancy. Of the 10 control monkeys, 9 delivered live offspring. (The spontaneous abortion rate among untreated females in our colony is approximately 12%). Of the 10 monkeys in the 0.05 mg/kg group, all gave birth to normal babies. Seven of the monkeys receiving 1.0 mg/kg doses delieved live offspring; there was 1 stillborn fetus and 1 abortion,

and 1 female has yet to deliver. Six of the monkeys receiving 10.0 mg/kg doses had live offspring; there were 2 abortions, and 2 females have not delivered. Hematology, clinical chemistry, and urinalysis data obtained on all females prior to and immediately following the administration of the 2,4,5-T and at 2-month intervals until parturition indicated no toxicity to the female. Detailed examination of the live infants and the stillborn fetus, including sketelal X-ray studies, revealed no gross developmental abnormality in any of the groups. Under the conditions of this experiment there is no evidence that 2,4,5-T is teratogenic in the rhesus monkey, nor that it interferes in any way with normal development of the young. (Author abstract by permission) (Abstract no. 9)

75-0096. Ulland, B.; Weisburger, E. K.; Weisburger, J. H. (Litton Bionetics Inc., Kensington, MD). **Chronic toxicity and carcinogenicity of industrial chemicals and pesticides.** *Toxicol. Appl. Pharmacol. 25(3); 446; 1973.*

Two-year studies were conducted in Charles River CD rats to determine the chronic toxicity or carcinogenicity of environmental chemicals. The maximal tolerated dose and half that level, experimentally determined for each chemical, were either incorporated into ground diet or given by gastric intubation twice weekly to male and female rats. In most instances, experimental materials were administered for 18 months followed by a 6-month observation period. *N*-2-Fluorenylacetamide was used as a positive carcinogenic control. At the termination of these studies, there was a high incidence of benign tumors in surviving negative control and experimental animals. These benign tumors principally affected the pituitary and mammae. Under the conditions of this experiment, the following chemicals were determined to be noncarcinogenic: Sodium azide, bis(2-chlorethyl)-ether, Mirex, saccharin (*o*-benzoic sulfimide), semicarbazide, and ethylene carbonate. Semicarbazide, however, proved to be a lathyrogen and affected the high-dose animals starting at the 10th week of the study. These animals suffered severe skeletal deformities. Ethylene carbonate caused severe nephrotoxicity, especially to the high-dose males, which was not observed in the preliminary toxicological experiments. There was an increased incidence of tumor-bearing animals when compared to negative control animals with the potassium salt of bis(2-hydroxyethyl)dithiocarbamic acid and Avadex. However, a wide variety of organs was affected and there was no definitve increase in tumors at one site. (Author abstract by permission) (Abstract no. 19)

75-0097. Jordan, R. L; Borzelleca, J. F. (Dept. of Anat. and Pharmacol., Med. College of Virginia, Health Sciences Div., Virginia Commonwealth Univ., Richmond, VA). **Teratogenic studies with pentachloronitrobenzene in rats.** *Toxicol. Appl. Pharmacol. 25(3): 454; 1973.*

The soil fungicide pentachloronitrobenzene (PCNB) was given in pregnant rats at dosages from 100 ppm to 1563 ppm to assess its effects on embryogenesis. PCNB, dissolved in corn oil, was administered to timed pregnant Charles River Strain Albino rats by oral intubation on days 6 through 15 of gestation. On day 20, dams were sacrified and fetuses removed and examined for gross malformations. In addition, the number of corpora lutea, position and number of dead and/or resorbed fetuses, fetal weights and sex-ratios were recorded. None of these indices differed significantly from control values at any level of treatment with PCNB. Following gross examination, one-half of the fetuses were cleared and stained with alizarin red-S for visualization of potential skeletal defects and the remainder either fixed in Bouin's solution prior to free-hand razor blade sectioning for visceral examination or stored in formalin. Examination of fetal skeletons revealed little or no difference between controls and treated groups in either the number or type of skeletal malformations or in the incidence of minor skeletal variations such as rudimentary accessory ribs. The number of soft tissue anomalies detected during sectioning of PCNB-treated fetuses did not differ significantly from that of controls. (Author abstract by permission) (Abstract no. 40)

75-0098. Courtney, D. (Environ. Protect. Agency, Perrine Primate Lab., Perrine, FL). **The effect of pentachloronitrobenzene on fetal kidneys.** *Toxicol. Appl. Pharmacol. 25(3): 455; 1973.*

Pentachloronitrobenzene, a fungicide, inhibits kidney formation in the C57B1/6 mouse fetus. Oral administration of 500 mg/kg, daily, from day 7 to 11 of gestation produced effects in 80% of the litters. Renal agenesis occurred unilaterally about two times more often than it occurred bilaterally. Samples of blood, urine, liver, kidney, fat, placenta and fetuses were analyzed for pentachloronitrobenzene and its possible metabolites: pentachlorobenzene, pentachloroaniline, pentachlorphenylsufide and hexachlorobenzene. Fat contained the highest concentration of all compounds at all times studied. Fetuses contained higher concentrations of the metabolites than of pentachloronitrobenzene. By 24 hr the tissue content of pentachloronitrobenzene in the maternal tissues was very low or non-detectable while the metabolites were readily detectable. (Author abstract by permission) (Abstract no. 41)

75-0099. Hinkle, D. K. (Environ. Protect. Agency, Perrine Primate Lab., Perrine, FL). **Fetotoxic effects of pentachlorophenol in the golden Syrian hamster.** *Toxicol. Appl. Pharmcol. 25(3): 455; 1973.*

Pentachlorophenol or its derivatives are widely used as contact herbicides and/or for control of termites and other boring insects. Oral administration of levels ranging from 1.25 to 20.0 mg/kg daily from day 5 to 10

of gestation was done to assess possible fetotoxic effects of this compound. Fetal deaths and/or resorptions were observed in 3 of 6 test groups. Samples of maternal blood and fat, as well as entire fetuses, were analyzed for pentachlorophenol. There was close correlation between the concentrations of PCP recovered from the maternal blood and the fetuses. The highest measured concentrations in the blood, fat and fetuses occurred within 3 hr following the last administerd oral dose. Concentrations in fat persisted in measurable amounts up to 120 hr following the last oral dosing and exceeded the blood and fetal concentrations at that time. (Author abstract by permission) (Abstract no. 42)

75-0100. Schwetz, B. A.; Gehring, P. J. (Chem. Biol. Res., Dow Chem. Co., Midland, MI). **The effect of tetrachlorophenol and pentachlorophenol on rat embryonal and fetal development.** *Toxicol. Appl. Pharmacol. 25(3): 455; 1973.*

This study evaluated the effects of 2,3,4,6-tetrachlorophenol and pentachlorophenol on rat embryonal and fetal development. Dose levels up to and including a maximally tolerated dose (30 mg tetrachlorophenol/kg/day, 50 mg pentachlorophenol/kg/day) was administered orally to pregnant Sprague-Dawley rats on days 6 through 15 of gestation. Additional groups of rats received 30 mg pentachlorophenol/kg on days 8 through 11 or 12 through 15 of gestation. The only fetal anomaly associated with the administration of tetrachlorophenol was delayed ossification of the skull bones, evidence of fetal toxicity. Following the administration of pentachlorophenol, signs of toxicity to the embryo and fetus such as subcutaneous edema, dilated ureters and minor anomalies of the skull, ribs, vertebrae and sternebrae were observed at an incidence which increased with dose levels. The developing rat embryo is most susceptible to the toxic effects of pentachlorophenol during early organogenesis. Neither tetrachlorophenol nor pentachlorophenol were truly teratogenic in the rat. The dose level of these materials which caused no toxicity to the embryo or fetus was 10 mg tetrachlorphenol/kg/day and 5 mg pentachlorophenol/kg/day. (Author abstract by permission) (Abstract no. 43)

75-0101. Khera, K. S. (Food Res. Lab., Health Protect. Branch, Nat. Health and Welfare, Ottawa, Ontario, Canada). **Teratogenic effects of ethylenethiourea in rats and rabbits.** *Toxicol. Appl. Pharmacol. 25(3): 455; 1973.*

Ethylenethiourea (ETU), a degradation product of the ethylenebisdithiocarbamate group of fungicides and identified recently as a crop residue, was studied for teratogenic activity. Single daily po doses of 0, 10, 20, 40 or 80 mg/kg of ETU in aqueous solution were administered to nulliparous rats and does. Three experiments in rats with varied treatment-duration and a single experiment in does were conducted. Dosing was programmed in rats from pre-pregnancy (21 days or more) to pregnancy day 15, from 6–15 days or from 7–20 days of pregnancy and in does from 7–20 days of pregnancy. All experiments in rats revealed ETU induced meningoencephalocele, meningorrhagia, meningorrhea, hydrocephalus, agenetic cerebellum, disoriented ependymal layer surrounding an obliterated neural canal, abnormal pelvic limb posture with equinovarus and short or kinky tail but no adverse effect on fetal survival. Incidence of most of the deformities was dose-dependent, minimal effect only being observed at 10 mg/kg. Results from the rabbit study suggested an increased incidence of resorption sites and decreased brain weight in the group treated with 80 mg ETU/kg. (Author abstract by Permission) (Abstract no. 44)

75-0102. Kimbrough, R. D..; Gaines, T. B.; Linder, R. E. (Chamblee Toxicol. Lab., Environ. Protect. Agency, Chamblee, GA). **The effect of 2,4-dichlorophenyl-*p*-nitrophenyl ether on the rat fetus.** *Toxicol. Appl. Pharmacol. 25(3): 456; 1973.*

In a reproduction study conducted in our laboratory and a similar study reported by Ambrose et al. (*Toxicol. Appl. Pharmacol.* 19: 263-275, 1971) dietary levels of 100 ppm or greater of technical 2,4-dichlorophenyl-*p*-nitrophenyl ether (TOK, nitrofen) fed to rats increased the number of dead pups. To determine whether the pups were stillborn, or died immediately after birth, 8 male and 8 female rats were fed 500 ppm technical TOK in the diet. They were pair-mated after 61 days and, counting day of insemination as day 0, the fetuses were removed by Cesarian section on day 20 of pregnancy. All the fetuses, a mean of 11.8/dam, were alive when taken but died during the next 12 hr. To determine wheter a contaminant, or the TOK itself, produced the effect, 3 groups of 11 pregnant rats each were dosed with TOK in peanut oil, or peanut oil alone, by stomach tube on days 7 through 15 of pregnancy. Day of insemination was counted as day 0. Group 1 rats, given 50 mg/kg/day of pure TOK, produced 10 litters with an average of 2.2 live and 7.3 dead pups. Group 2, given 50 mg/kg/day of technical TOK, produced 11 litters with an average of 12.7 live pups and none dead. Fetuses from dams exposed to TOK were cyanotic but normally formed. Hemoglobin and erythrocyte counts of fetuses from both TOK-treated and control dams were normal and methemoglobin was not elevated. Electron microscopic examination of the lungs of the pups suggested that poor expansion of the lungs in combination with less well developed lamellar bodies in alveolar epithelium and a possible effect on surfactant may cause the rapid death after birth of the offspring of the TOK-treated dams. (Author abstract by permission) (Abstract no. 45)

75-0103. Spiegel, P. A.; Cranmer, M. F. (Environ. Protect. Ag., Perrine Primate Lab., Perrine, FL). **The**

influence of *p,p'*-DDE, a model liver microsomal enzyme stimulator, on *p,p'*-DDT toxicity in the bluegill, *Lepomis macrochirus* (Rafinesque). *Toxicol. Appl. Pharmacol. 25(3): 471; 1973.*

The possible role of liver microsomal enzyme (LME) induction in mechanisms operative in providing fish with resistance to toxic foreign substances, such as insecticides, was investigated. Hatchery-reared populations of the bluegill, *Lepomis macrochirus* (Rafinesque), were pretreated with different water and food concentrations of *p,p'*-DDE prior to acute exposure to *p,p'*-DDT. LME activity was determined by gas–liquid chromatography and liquid scintillation analyses of extracts of parathion-LME incubates. These analyses indicated that LME of the blue gill are unable to metabolize paraoxon. Exposure to DDT in the water produced a toxic effect on the liver and no induction of the LME system. DDE pretreatment resulted in higher susceptibility to DDT toxicity. Both control and treated fish demonstrated a wide range of LME activity. Although statistically significant differences were not demonstated between the control and treated groups, a few individuals in the treated group showed exceptionally high LME activity. The results of this study support the conclusion that induction of LME does not play a major role in fish resistance to DDT. (Author abstract by permission) (Abstract no. 85)

75-0104. Chadwick, R.; Linko, R.; Freal, J.; Robbins, A. (Perrine Primate Lab., Perrine, FL). **The effect of age and long-term, low-level DDT exposure on the response to enzyme induction in the rat.** *Toxicol. Appl. Pharmacol. 25(3): 471-472; 1973.*

Some earlier studies have indicated there is an age-dependent susceptibility to enzyme induction in animals while other work indicates that the apparent lack of response in older animals may just be the result of an induction lag period. The existence of such an induction lag as well as the effect of long term low level DDT exposure on the response to enzyme induction were investigated in this study. Groups of weanlings and 14-month-old adult female rats received either 2.5 mg/kg of dieldrin in DMSO or just DMSO ip. Half the adults had received 5 ppm DDT in their feed since they were 3 months old. The rats were sacrificed at 24, 48, 72, 96 and 120 hr after the administration of dieldrin. Twenty-four hours before each group was sacrificed 10 mg/kg of lindane in peanut oil was administered po. Within 24 hr after the administration of dieldrin, there were significant increases in the in vitro activity of various hepatic microsomal enzymes from the weanling rats. There were no such increases in the activities of these enzymes in the adults. In general, throughout the study, the weanlings had the highest enzyme activity, the DDT-fed adults were next and the control adults had the lowest activity. In the metabolism of lindane to chlorophenols, the weanlings exceeded the adults within 72 hr after the administration of dieldrin. Similarly, the storage of lindane in the body fat of the weanling significantly decreased at 72 hr below that observed in the adults. There was no evidence of an induction time lag in this study. If such a lag exists, it must exceed 120 hr. Data from the experiment support the suggestion of age-dependent susceptibility to enzyme induction. (Author abstract by permission) (Abstract No. 86)

75-0105. Gingell, R.; Wallcave, L. (Eppley Inst. for Res. in Cancer, Univ. of Nebraska Med. Cent., Omaha, NB). **Some species differences in DDT metabolism and tissue distribbution.** *Toxicol. Appl. Pharmacol. 25(3): 472; 1973.*

p,p'-DDT has been shown to be a weak carcinogen in mice, but is non-tumorigenic in hamsters. The mouse is also more susceptible to the acute and subacute toxic effects of DDT. Tissue levels of DDT and residues were 7–8 times higher in mice than in hamsters maintained on a diet containing 250 ppm DDT for 6 weeks. The levels of DDE in mouse liver were relatively much higher than in the hamster tissue, and DDT levels relatively lower, suggesting that there may be a quantitative species difference in DDT metabolism via DDD to conjugates of bis-(p-chlorophenyl)-acetic acid (DDA), which are excreted. When [^{14}C]-DDT (25 mg/kg) was administered po to mice and hamsters there was little difference in the amounts of ^{14}C recovered in the urine. However when [^{14}C]DDT was administered to animals maintained on a diet of 250 ppm DDT for 6 weeks, hamsters excreted 2–3 times more ^{14}C than mice, suggesting that dietary DDT enhances its own metabolism and excretion in hamsters, but not in mice. This dietary DDT treatment decreases hexobarbital sleeping time in hamsters, but has little effect in mice. Species differences in the toxicity and carcinogenicity of DDT may thus be explained by this species difference in the effect of DDT treatment on DDT metabolism and excretion. (Author abstract by permission) (Abstract no. 87)

75-0106. Wallcave, L.; Gingell, R.; Bronczyk, S. (Eppley Inst. for Res. in Cancer, Univ. of Nebraska Med. Cent., Omaha, NB). **Urinary and fecal metabolites of *p,p'*-DDT in the Syrian golden hamster and Swiss mouse.** *Toxicol. Appl. Pharmacol. 25(3): 472; 1973.*

Previous studies have shown that the Syrian hamster is resistant to *p,p'*-DDT in the diet at levels as high as 1000 ppm whereas several strains of mice are profoundly affected with neurological and other toxic signs after being on a diet containing over 250 ppm of *p,p'*-DDT for a few weeks. In order to determine if this species difference is related to metabolic differences, the urine and feces of hamsters and mice fed 250 ppm of *p,p'*-DDT in the diet were examined. Ether extracts of base-hydrolyzed urine were methylated and analyzed by gas chromatography. In both series the principal urinary metabolite was an alkali labile conjugate, probably the glucuronide, of bis(*p*-chlorophenyl)acetic acid (*p,p'*-

DDA), but smaller amounts of conjugates of DDT with glyane and alanine were also found. The identified of the conjugates, bis(*p*-chlorophenyl–acetylglycine and bis(*p*-chlorophenyl)acetylalanine, were proved by mass spectrometry and chromatographic identification with authentic synthetic samples. Neither metabolite has previously been described. Feces were extracted with acetic acid-hexane and the principal neutral metabolite was *p,p'*-DDD. Little unabsorbed DDT was present. It does not appear that qualitative differences in the nature of excreted DDT metabolites in the hamster and mouse can explain the differing toxic effect of that compound in the two species. (Author abstract by permission) (Abstract no. 88)

75-0107. Harbison, R. B. (Dept. Pharmacol., Cent. Toxicol., Vanderbilt Med. Cent., Nashville, TN) **DDT, heptachlor, chlordane, and parathion toxicity in adult, newborn, and phenobarbital-treated newborn rats.** *Toxicol. Appl. Pharmacol. 25(3): 472-473; 1973.*

Pesticide lethality and effect of phenobarbital (PB) treatment on pesticide lethality were compared between age groups. DDT, heptachlor (H), chlordane (C), and parathion (P)-induced lethality were determined in adult (A), newborn (NB), and PB-treated NB rats. Adult Sprague-Dawley rats, 100 to 120 g, and 5-day postpartum NB rats, 10 to 12 g, were used in the study. PB, 40 mg/kg, was administered for 4 days and the pesticide administered on day 5. Median lethal dosage (MLD) was calculated from the number of deaths at the end of a 7-day period. DDT MLD is 224 mg/kg for A and 2356 mg/kg for NB. PB treatment of NB rats enhances lethality of DDT to a MLD of 1344 mg/kg. Heptachlor MLD is 71 mg/kg for A and 531 mg/kg for NB. PB treatment of NB rats enhances lethality of H to a MLD of 133 mg/kg. Chlordane MLD is 344 mg/kg for A and 1121 mg/kg for NB. PB pretreatment of NB rats enhances lethality of C to a MLD of 539 mg/kg. Thus, toxicity of DDT, H, and C is 5 to 10 times less in NB when compared to A, but PB treatment enhances the toxicity of all three pesticides in the NB. Parathion MLD is 8.8 mg/kg in A and 1.9 mg/kg in NB. However, PB treatment of NB rats antagonized P lethality to a MLD of 4.8 mg/kg. Toxicity of DDT, C, H, and P is age dependent and altered by PB treatment. Although PB treatment antagonized P toxicity it enhances DDT, C, and H toxicity. (Author abstract by permission) (Abstract no. 89)

75-0108. Poore, R. E.; Neal, R. A. (Cent. Environ. Toxicol., Dept. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN). **The extrahepatic metabolism of parathion to paraoxon.** *Toxicol. Appl. Pharmacol. 25(3): 473; 1973.*

A semiquantitative method for measuring the in vivo metabolism of parathion to paraoxon has been developed. The metabolism that has occurred in individual tissues is determined by the amount of radioactive sulfur that is released and subsequently covalently bound to the tissues in the metabolism of S^{35} labelled parathion to paraoxon. The in vivo metabolism of parathion to paraoxon has been measured in 9 tissues. Pretreatment of rats with SKF 525-A and piperonyl butoxide 1 hr prior to administration of parathion decreased in vivo metabolism of parathion to paraoxon in the liver, lung, and brain. A comparison of the amount of sulfur bound to tissues at three different levels of parathion intake has also been made. At an oral dose of 12/mg/kg of [^{35}S]parathion, tissues from weanling male rats showed less metabolism than the same tissues from the adult male rat. Our data show that the in vivo metabolism of parathion to paraoxon in individual organs or tissues can be measured semiquantitatively and that the amount of metabolism that occurs in a tissue varies with the tissue examined. (Author abstract by permission) (Abstract No. 90)

75-0109. Whitehouse, L.; Ecobichon, D. J. (Dept. Pharmacol., Dalhousie Univ., Halifax, NS, Canada). **Species variations in the activation and degradation of parathion by mammalian hepatic enzymes.** *Toxicol. Appl. Pharmacol. 25(3): 473; 1974.*

The toxicity of phosphorothionate insecticides in animal species is largely dependent upon the rate of "oxon" formation and the rate of hydrolytic and/or oxidative degradation by hepatic enzymes. The in vitro activation of parathion (*O,O*-diethyl-*O*-4-nitrophenyl phosphorothionate) was studied using isolated hepatic microsomes from the following species: mouse, hamster, rat, guinea pig, rabbit, cat, dog, hog, cow and human. The incubation mixture (5.0 ml) consisting of microsomes, substrate, a NADPH-generating system, EDTA and Tris-HCl buffer (pH 7.4), was extracted with ethyl acetate and the metabolite paraoxon (*O,O*-diethyl-*O*-4-nitrophenyl phosphate, PO) was quantitatively analyzed by gas-liquid chromatography using an electron capture detector and a column packed with 3% OV-1 on Chromosorb W-HP (80-100 mesh). Using short incubation times (2.5-15 min), the initial rates of activation were estimated graphically. Kinetic constants (Km, *V*max) and average initial rates of PO formation were determined for males and females of each species. Statistically significant strain and sex differences were observed in the laboratory animal species. Few significant differences were observed between males and females of the larger species and humans, the variations in activity being much greater. The rate of PO hydrolysis was investigated using a spectrophotometric technique to determine the formation of 4-nitrophenol by hepatic arylesterases. Activities varied considerably from species to species, no activity being detected in the guinea pig while rat and rabbit liver exhibited the highest rates of hydrolysis. (Author abstract by permission) (Abstract no. 91)

75-0110. Benke, G. M.; Cheever, K. L.; Murphy, S. D. (Dept. Physiol., Harvard Sch. Pub. Health, Boston, MA). **Comparative toxicity, anticholinesterase action, and metabolism of methyl parathion, parathion, and guthion in sunfish and mice.** *Toxicol. Appl. Pharmacol. 25(3): 473-474; 1973.*

Methyl parathion has been suggested as a substitute for many uses of DDT. The literature indicates that the organophosphorus insecticides methyl parathion, parathion and guthion are nearly equitoxic to rats by the oral route. However, parathion is 20 times more toxic and guthion is nearly 400 times as toxic as methyl parathion in sunfish when tested by 96-hr LC50 determinations. We found that lethal dose ranges (by ip injection) in pumpkinseed sunfish for methyl parathion, parathion and guthion were > 2500, 10–200 and 1–10 mg/kg respectively. In mice, corresponding values were 10–12, 13–15 and 3–4.5 mg/kg. Lethal dose ranges for the corresponding oxygen analogs (methyl paraoxon, paraoxon and gutoxon) in sunfish were 8–20, 5–10 and 0.01-0.05 mg/kg. The greater toxicity of guthion relative to methyl parathion and parathion in sunfish, could be partly explained on the basis of greater sensitivity of their brain and muscle cholinesterase as indicated by in vitro I50 values of $4.8 \times 10^{-10} M$ for brain and $2.4 \times 10^{-10} M$ for muscle. I50 values for sunfish brain for methyl paraoxon and paraoxon were $2 \times 10^{-8} M$ and $2.4 \times 10^{-8} M$ respectively and for muscle were 4×10^{-8} *and* $1.8 \times 10^{-7} M$. Therefore brain cholinesterase sensitivity cannot explain the differences in susceptibility of sunfish to poisoning by methyl parathion and parathion. The nearly equal toxicity of paraoxon and methyl paraoxon suggest that either methyl parathion is detoxified more rapidly than parathion or that parathion is activated to paraoxon at a greater rate in sunfish. However, in vitro studies showed that the rates of activation of the two thiono derivatives by fish-liver homogenates did not differ sufficiently to explain the differences in toxicity. In addition, the oxidative cleavage of parathion and methyl parathion to *p*-nitrophenol and the dialkyl phosphates proceeded at approximately the same rates. It appears that alternate detoxication pathways in liver or extrahepatic tissues must be sought to provide a metabolic explanation for differences in the toxicity of parathion and methyl parathion in sunfish. (Author abstract by permission) (Abstract no. 92)

75-0111. Ludke, J. L.; Hill, E. F.; Dieter, M. P. (Patuxent Wildl. Res. Center, Bur. Sport Fish. Wildl., Laurel, MD). **Cholinesterase inhibition and mortality of Japanese quail following dietary exposure to parathion (*O,O*diethyl-*p*-nitrophenyl phosphorothioate).** *Toxicol. Appl. Pharmacol. 25(3): 474; 1973.*

Plasma and red blood cell cholinesterase (ChE) activity has been used extensively as a monitoring method for exposure of human beings to organophosphorus (O-P) insecticides. Brain ChE activity has been helpful on a limited basis in monitoring exposure of wildlife to O-P compounds. The dietary LC50 and brain and plasma ChE activities were studied in Japanese quail of different ages and sex exposed to parathion in an effort to correlate ChE activity and mortality with exposure time and concentration. There were no marked differences in brain ChE activity attributable to age or sex. Plasma ChE in sexually mature females averaged 82.5% that of males. There was a relationship between the degree of parathion exposure and brain ChE levels: no birds that died had a brain ChE activity exceeding 55% of normal and enzyme activity lower than 80% of normal was considered indicative of parathion intoxication. The dietary LC50 values were 150, 197, 295, and 1,739 ppm for 1, 2, 4 and 8-week old birds respectively. (Author abstract by permission) (Abstract no. 93).

75-0112. Klaassen, C. D. (Univ. of Kansas Med. Cent., Kansas City, KS). **Biliary excretion of arsenic.** *Toxicol. Appl. Pharmacol. 25(3): 475; 1973.*

The disappearance of arsenic-74 from the blood and plasma of rats and its excretion into the bile was measured for 2 hr after the iv administration of 0.01, 0.46, 1.0, 2.1, and 4.6 mg/kg of arsenic given as the trichloride. Arsenic disappearance from the plasma was biphasic; the half-life during the late phase was greater than 2 hr. Even though the arsenic was injected iv, the concentration in the blood increased throughout the first 2 hr. Arsenic was r pidly excreted into the bile, reaching its highest rate of excretion 6 min after administration; the rate then rapidly decreased. This rapid decrease in excretion is due to redistribution of arsenic from the liver to the blood. Arsenic enters bile against a bile/plasma concentration gradient of 630, 8 min after a 1 mg/kg dose of arsenic. At this time the liver/plasma gradient is 17 and the liver/bile gradient is 37. Twenty-five percent of the arsenic administered to bile duct-cannulated rats is excreted into the bile within 2 hr after administration. However, less than 10% of the administered dose is excreted into the feces of intact rats over a 7-day period. These data demonstrate that arsenic is excreted into the bile of rats. Further, these data suggest that arsenic is transported into bile by an active transport system, and then enters an enterohepatic circulation. (Author abstract by permission) (Abstract No. 96)

75-0113. Sharma, R. P.; Watanabe, P. G. (Toxicol. Curriculum, Utah State Univ., Logan, UT). **Metabolism and elimination of tri-*o*-tolyl phosphate (TOTP), a neurotoxic organophosphate, in chicken.** *Toxicol. Appl. Pharmacol. 25(3): 483; 1973.*

Tri-*o*-tolyl phosphate (TOTP; also tri-*o*-cresyl phosphate; TOCP) is present in a widely used commercial compound, tricresyl phosphate (TCP), used as flame retardant, plasticizer, lubricant, gasoline additive, etc. TOTP has been responsible for causing a delayed

paralysis in a large number of people at various times. Chickens resemble man in their response to TOTP, both in the clinical signs and the time lapse before paralysis appears. Little is known about the metabolism and elimination of TOTP in chickens. Adult White Leghorn hens were given 1.16 g(1 ml) of [^{3}P]TOTP(243 μCi) po. The relative distribution of the radioactivity, in terms of TOTP and its metabolites was followed at different time intervals up to 72 hr in plasma, liver and excretory products. Radioactivity was concentrated in liver; the concentration at 72 hr was 25 times greater than in plasma. TOTP and three metabolites were separated from the liver using adsorption column chromatography; these metabolites showed similar chromatographic characteristics to those reported in rats. Metabolite I, presumably the cyclic saligenin, was the major metabolite appearing in the liver; the amount of TOTP and its major metabolite increased throughout the 73-hr period. The liver concentration of metabolite I increased from 8.5 μg/g at 1 hr to 377 μg/g at 72 hr (expressed as TOTP). A fraction of the administered TOTP appeared to be excreted unabsorbed during the first 24 hr. The total rate of excretion increased during the first 12 hr and then declined. The results indicated that TOTP is slowly metabolized and excreted; the compound and its metabolites are retained in the visceral organs for several days after a single oral dose. (Author abstract by permission) (Abstract no. 116)

75-0114. Ferguson, D. M. (Imperial Chem. Ind. Ltd., Alderley Park, Macclesfield, Cheshire, England). **Factors influencing renal excretion of paraquat.** *Toxicol. Appl. Pharmacol. 25(3): 486; 1973.*

Paraquat (PQ;1,1'-dimethyl-4,4'-dipyridyl) is the most important of a series of bipyridylium herbicides with unusual toxicological properties. The mechanism by which paraquat is excreted in the kidney has been studied using anesthetized adult male beagle dogs. In clearance experiments, PQ-to-inulin clearance ratios indicated net reabsorption of paraquat within the kidney; the fraction of the filtered paraquat reabsorbed varied from 0.25 to 0.75. The facts that clearance was independent of plasma paraquat concentration over a wide range (10–150 μg/ml) and that urine-to-plasma concentration ratios always exceeded unity, though approaching it at high urine flow rates, suggests that reabsorption is passive. The effect of urine flow rate on clearance was examined using mannitol (osmotic diuresis) or specific diuretics (mersalyl, ethacrynic acid and furosemide). A direct reltionship between the two parameters was seen in most experiments. Substitution of iso-osmotic sodium chloride solutions for hypertonic mannitol infusions reduced urine flow, but unexpectedly increased the percentage excretion of paraquat. Urine pH was altered by ammonium chloride or sodium bicarbonate po or by iv infusion of 0.1 N hydrochloric acid or sodium bicarbonate. Over the range pH 5–8, clearance remained constant. This is consistent with the view that paraquat exists as a cation at physiological pH. Initial stopflow experiments indicated that paraquat was reabsorbed in the proximal half of the nephron; there was no indication of a secretory component. Subsequent experiments have been more equivocal. In summary, paraquat is reabsorbed in the dog kidney, probably in the proximal tubules. Most results can be explained by passive diffusion although the presence of an active component has not been completely excluded. (Author abstract by permission) (Abstract no. 123)

75-0115. Fang, S. C.; Fallin, E.; Freed, V. H. (Dept. Agr. Chem., Oregon State Univ., Corvallis, OR). **In vivo and in vitro metabolic studies of ^{14}C-labeled propham and chlorpropham in the rat and rat tissues.** *Toxicol. Appl. Pharmacol. 25(3): 493; 1973.*

The excretion and tissue distribution of [2-^{14}C]-isopropyl-*m*-chlorocarbanilate([chain-^{14}C]-chlorpropham), [isopropyl-ring-^{14}C]-*m*-chlorocarbanilate ([ring-^{14}C]-chlorpropham), [2-^{14}C]-isopropyl-carbanilate ([chain-^{14}C]-propham), and [isopropyl-ring-^{14}C]-carbanilate ([ring-^{14}C]-propham) were investigated in the adult female rat after a single oral dosage. The average 3-day urinary excretions were 55.9, 82.6, 79.5 and 85.4% of the oral dose for [chain-^{14}C]-chlorpropham, [ring-^{14}C]-chlorpropham, [chain-^{143}C]-propham and [ring-^{14}C]propham, respectively. With [chain-^{14}C]chlorpropham 35.4±7.5% of the administered radioactivity appeared in the respired air, whereas only 5.0±0.8% was found in CO_2 from [chain-^{14}C]-propham. There was no significant difference in the rate of excretion or the route of elimination among rats receiving different oral dosages, ranging from less than 4 to 200 mg/kg. The radioactivity was distributed in all tissues; the highest concentration was found in the kidney. The average biological half-life of chlorpropham and propham in most organs was short, ranging between 3 to 8 hr; however, it was about twice as long in the brain, fat and muscle. Both compounds were metabolized by hydrolytic and oxidative mechanisms and the resulting metabolites were excreted either as free forms or as conjugates. Paper chromatographic and TLC separation of urine samples revealed the presence of 2 major and at least 3 minor metabolites; the relative ratio of the labeled urinary metabolites was dependent on the dosage used, the ^{14}C-labeled position, and the time of sampling. Subcellular distribution of ^{14}C in the rat liver and kidney following an oral administration of chlorpropham and propham or in vitro incubation of the tissue slices with the labeled herbicides was investigated. The percentage distribution of ^{14}C in the particulate and soluble fractions was dependent on several factors, particularly the compound used and the time of reaction. The binding of chlorpropham to mitochondrial and microsomal fractions was always greater than that of propham. In vitro incubation studies of kidney or liver slices with labeled herbicides revealed that the chain moiety of these herbicides was not hydrolyzed and

degraded to CO_2 as found in the in vivo experiment. Only liver slices can convert the herbicides to their metabolites suggesting that the liver is a possible site for degradation of these compounds in vivo. (Author abstract by permission) (Abstract no. 140)

75-0116. Koepke, U. C.; Coon, J. M.; Triolo, A. J. (Dept. of Pharmacol., Jefferson Med. Coll. of Thomas Jefferson Univ., Philadelphia, PA 19107). **Effect of paraoxon on the hypnotic action of chloral hydrate.** *Toxicol. Appl. Pharmacol. 30(1): 36-51; 1974.* (31 references)

Paraoxon decreased induction time (IT) and increased the duration of the loss-of-righting-reflex time (LORRT) of chloral hydrate (CH) and trichloroethanol (TCE) in mice. Atropine sulfate, but not the peripherally acting agents atropine methylnitrate and pralidoxime, prevented these effects of paraoxon on the activity of CH, suggesting that such effects may be mediated through a central cholinergic mechanism. Mice treated with paraoxon showed high concentrations of CH and lower concentrations of TCE in brain and plasma 15 min after CH. However, paraoxon treatment of animals did not affect the rate of metabolism of CH by homogenates of their livers. Paraoxon treatment increased the permeability of the blood brain barrier to TCE at 5 min, but not at 30 min, after the administration of CH. The increased brain permeability to TCE may partially explain the shortened IT of CH in animals. Decreased brain concentrations of CH and TCE at both the loss and return of the righting reflex indicated that paraoxon increased the sensitivity of the brain to the depressant action of these hypnotics. Paraoxon, known to cause hypoxia, also caused hypothermia. The paraoxon-induced hypothermia, but not the effects on IT and LORRT, was prevented at 36°C ambient temperature. A single dose of sodium nitrite produced effects similar to those of paraoxon on the hypnotic activity of CH and TCE. It is suggested that a decreased rate of metabolism and an increased sensitivity of the central nervous system due to hypoxia is the primary mechanism by which paraoxon shortens the IT and prolongs the LORRT of CH and TCE. (Author abstract by permission)

75-0117. Rasul, A. R.; Howell, J. M. (Dept. of Vet. Pathol., Univ. of Liverpool, Liverpool, England). **The toxicity of some dithiocarbamate compounds in young and adult domestic fowl.** *Toxicol. Appl. Pharmacol. 30(1): 63-78; 1974.* (28 references)

Sodium diethyldithiocarbamate, sodium dimethyldithiocarbamate (Dibam), ferric dimethyldithiocarbamate (ferbam), zinc dimethyldithiocarbamate (ziram), and tetramethylthiuram disulphide (thiram), were given po to young and adult domestic fowl. All these compounds had an adverse effect on body weight, retarded testicular development, and produced degeneration in the seminiferous epithelium of mature birds. Nerve fiber degeneration was produced in the medulla and spinal cord of chicks by sodium diethyldithiocarbamate and of cocks by sodium dimethyldithiocarbamate. This is the first record of nerve fiber degeneration being produced by sodium dimethyldithiocarbamate. Chicks given thiram became lame, and their long bones developed greatly swollen epiphyses. This was due to abnormal endochondral ossification, giving rise to a thickened cartilaginous epiphyseal plate. Ziram was the most toxic of the compounds, and sodium diethyldithiocarbamate and tetramethylthiuram disulphide appeared to be more toxic to adult fowl than sodium or ferric dimethyldithiocarbamate. (Author abstract by permission)

75-0118. Den Tonkelaar, E. M.; Van Logten, M. J. (Lab. Of Toxicol., Nat. Inst. of Public Health, Bilthoven, The Netherlands). **Protective action of dithiocarbamates on experimental liver damage produced by carbon tetrachloride.** *Toxicol. Appl. Pharmacol. 30(1): 96-106; 1974.* (13 references)

The protective action of dithiocarbamates of CCl_4-induced liver damage in rats was assessed with liver function tests (BSP-retention test and SGPT). When given immediately before CCl_4, all dithiocarbamates tested showed a protection against CCl_4 hepatotoxicity except for zineb and some "polymer" dithiocarbamates. For zineb it appears plausible that this was caused by a delayed absorption. No protection was found when one of the dithiocarbamates studied was given 1 hr after CCl_4 administration. From studies with some metabolites and related compounds it appears that only substances containing a carbon disulphide group have a protective action. Probably these compounds function as effective free radical scavengers. In addition, inhibition of microsomal liver enzyme activity and a lowering of body temperature could also be contributing factors. (Author abstract by permission)

75-0119. Thomas, J. A.; Schein, L. (Dept. of Pharmacol., West Virginia University Medical Center, Morgantown, WV 26506). **Effects of thiophanate and thiophanate-methyl on the male reproductive system of the mouse.** *Toxicol. Appl. Pharmacol. 30(1): 129-133; 1974.* (5 references)

The daily administration of thiophanate (295 mg/kg) or thiophanate-methyl (195 mg/kg) had no effect upon spermatogenesis or the ability of the prostate gland to assimilate [1,2-^{3}H]testosterone. Little change occurred in the weights of the sex accessory organs, though there were significant increases in the weight of the prostate gland. The weights of the adrenal glands also increased significantly in the treated mice. (Author abstract by permission)

75-0120. Knowles, C. O.; Aziz, S. A. (Dept. Entomol., Univ. Missouri, Columbia, MO 65201). **Toxicity of benzoyl chloride (2,4,6-trichlorophenyl) hydrazone (Banamite) and potential metabolites to twospotted spider mites and potency as inhibitors of rat liver monoamine oxidase.** *Bull. Environ. Contam. Toxicol. 12(2): 158-160; 1974.* (8 references)

The slide-dip technique was used to determine the toxicity of benzoyl chloride (2,4,6-trichlorophenyl) hydrazone (Banamite) and potential metabolites to an organophosphate susceptible strain of twospotted spider mites. Banamite was the most toxic compound with an LC50 of 12 ppm. Other toxic compounds included benzaldehyde 2-(2,4,6-trichlorophenyl) hydrazone (LC50-110 ppm) 2,4,6-trichlorophenylhydrazine (LC50-21 ppm), and benzoylhydrazine (LC50-79 ppm). Benzoic acid 2-(2,4,6-trichlorophenyl) hydrazide, 2,4,6-trichloroaniline, benzoic acid, benzamide, benzaldoxime, and benzohydroxamic acid were relatively nontoxic, with LC50 values greater than 300 ppm. Benzaldehyde 2-(2,4,6-trichlorophenyl) hydrazone and 2,4,6-trichlorophenylhydrazine were inhibitors of rat liver monoamine oxidase, yielding I50 values of $1.2 \times 10^{-4} M$ and $4.7 \times 10^{-5} M$, respectively. It appears that 2,4,6-trichlorophenylhydrazine is involved in the toxic action of Banamite acaricide in twospotted spider mites.

75-0121. Albro, P. W.; Thomas, R. (Nat. Inst. Environ. Health Sci., NIH, Research Triangle Park, NC 27709). **Intestinal absorption of hexachlorobenzene and hexachlorocylohexane isomers in rats.** *Bull. Environ. Contam. Toxicol. 12(3): 289-294; 1974.* (8 references)

Male CD-strain Charles River rats received cottonseed oil solutions containing HCB or BHC and squalane as a single dose. Pulverized rat chow was allowed to soak up a pentane solution of 1 g of HCB and 0.6 g squalane, air-dried overnight, and fed to rats over a 2 week period. Excretion of HCB and BHC in the feces was complete by 96 hr following the single dose. It is assumed that the amount of material fed which appeared in the feces within this time frame of squalane excretion is not likely to have significant physiological effects on the animal. An overall average of 95.8% of a single 30-125 mg/kg dose of BHC in cottonseed oil was not passed out in the feces. Neither BHC nor squalane could be detected in either the intestinal tissue or contents at the end of the 96 hr. In the continuous feeding study, excretion rates varied with the particular isomer, the β-isomer being excreted to the greatest extent, nearly 10% while the most toxic isomer, γ, was barely excreted at all. The δ-isomer, the most liquid-soluble of the four considered, showed considerable time-dependent variation in excretion rate. In studies of hexachlorobenzene fed at two dose levels, 12 and 30 mg/kg, data indicated that HCB was more poorly absorbed and/or metabolized by rats than was BHC. Percentage removal was less for a high HCB dose. HCB could not be detected in either urine or bile collected at the end of the experiment.

75-0122. Greer, D. E.; Keil, J. E.; Stillway, L. W.; Sandifer, S. H. (Dept. Med., Med. Univ. South Carolina, Charleston, SC 29401). **The effect of DDT and PCB on lipid metabolism in *E. coli* and *B. fragilis*.** *Bull. Environ. Contam. Toxicol. 12(3): 295-300; 1974.* (20 references)

The principal human enteric aerobic and anaerobic bacteria, *Escherichia coli* and *Bacteroides fragilis*, were cultured in the presence of .01 and .1 ppm DDT and PCB. The bacteria were assayed for dry weight and total lipids. DDT at the 0.1 ppm level increased the growth of *E. coli*, but had no effect at .1 ppm. Neither DDT nor PCB significantly altered the total lipid content. DDT at the 1.0 ppm level depressed *B. fragilis* growth, but did not affect lipid levels. PCB at the .1 ppm level significantly increased growth of *B. fragilis* but significantly depressed lipid synthesis at both concentrations. The effect appeared dose dependent. All cultures metabolized DDT to its derivative DDE. Several replicates showed traces of DDE as well. DDT and PCB are statistically associated with cardiovascular disease risk factors, but the mechanism does not appear to be that of increased lipid anabolism by enteric bacteria.

75-0123. Post, G.; Leasure, R. A. (Colorado State Univ., Fort Collins, CO 80521). **Sublethal effect of malathion to three salmonid species.** *Bull. Environ. Contam. Toxicol. 12(3): 312-319; 1974.* (8 references)

The physical abilities of salmonids following quantitative reduction of AChE reserves produced by sublethal exposure to malathion have been examined. Three groups of 120 fish each were exposed to 3 concentrations of malathion to obtain brain AChE levels of about 75%, 45%, and 24% of the levels shown by nonexposed fish. There was great difference in the concentrations needed to reduce brain AChE residues to desired levels in the 3 species studied. Brook trout and rainbow trout were more vulnerable to sublethal amounts of malathion than were coho salmon. Brook trout and rainbow trout with AChE levels reduced to about 24 and 28% of the nonexposed levels showed less than one third (29%) of the ability to perform physical work. The data also indicated that about 20 to 30% of the stored AChE can be lost by rainbow trout and coho salmon before a loss greater than 5% of their physical abilities becomes apparent. Brook trout recovered to pre-exposure levels most rapidly, but even then about 25 days were required for those fish which had been depleted the most. Rainbow trout required 35 days and coho salmon, 42 days. Thus, the need for spacing malathion insecticide usage in ecosystems where this insecticide is used at intervals during a growing season becomes clear. These results indicate that the release of malathion into lakes and streams may not produce immediate loss of fishes, but may result in an inability for them to sustain physical activity in the search for food, maintain position in flowing water, or elude predatory animals.

75-0124. Crowder, L. A.; Dindal, E. F. (Dept. Entomol., Univ. Arizona, Tucson, AZ 85721). **Fate of ^{36}Cl-toxaphene in rats.** *Bull. Environ. Contam. Toxicol. 12(3): 320-327; 1974.* (11 references)

Male rats received ^{36}Cl-toxaphene (20 mg/kg, p.o. via stomach tube). The amount of toxaphene excreted in urine was greater than that observed with either dieldrin or mirex. Both single-dosed and redosed rats showed 90% of the dose recovered in the water fractions of feces. In almost all cases the greatest concentration of radioactivity in various tissues over a period from 3 hr to 20 days occurred at 12 hr, followed by a rapid decrease. Blood cells peaked at 3 days. Less than 10% of the dose remained after day 1. Most of the large concentration up to day 1 could be accounted for by the amount in the stomach. With respect to the nervous system, brain tissue did not concentrate an extraodinary amount of radioactivity. Fat storage appeared non-significant. Tissues and organs of rats following a redose of ^{36}Cl-toxaphene retained 6.0%. At the end of 20 days, it was determined that redosed rats had a 20% less dose retention than single-treated animals. Thus, rats retained less in their tissues when they contained a previous body burden.

75-0125. Keil, J. E.; Croft, H. W.; Sandifer, S. H. (Med. Univ. South Carolina, Charleston, SC 29401). **DDT association with glucose-6-phosphate dehydrogenase.** *Bull. Environ. Contam. Toxicol. 12(3): 343-345; 1974.* (8 references)

A pilot study was conducted to examine the association between serum DDT levels and an easily measured genetic marker, glucose-6-phosphate dehydrogenase, a red cell enzyme assisting in maintaining cell wall integrity. Deficiency of this enzyme is shown by intermittent anemia. The study included 16 pre-adolescent Black youths. DDT levels for the group ranged from 9 to 158 ppb; glucose-6-phosphate dehydrogenase levels ranged from 10-111 units. Most of the low enzyme levels occurred in the male subjects. A striking correlation was noted between total DDT and glucose-6-phosphate dehydrogenase. The *p,p'*- isomer of DDT showed a slightly stronger association. The correlation coefficient was high but not statistically significant for the *o,p'*- isomer or the DDE metabolite. This evidence links DDT burdens with genetic makeup.

75-0126. Phillips, J.; Wells, M.; Chandler, C. (Dept. Biol., Middle Tennessee State Univ., Murfreesboro, TN). **Metabolism of DDT by the freshwater planarian, *Phagocata velata*.** *Bull. Environ. Contam. Toxicol. 12(3): 355-358; 1974.* (8 references)

Planarians were collected from a pond outflow northeast of Murfreesboro, Tennsesee. Sample groups received a piece of beef liver (0.1 g) which had been perfused with 10 ppm DDT and allowed one hour for feeding. Sample extraction, clean-up, and gas liquid chromatography provided data indicating that *Phagocata velata* converts DDT into at least two metabolites: DDD (TDE) and DDE. There was no indication of metabolism of DDT by microorganisms in the water collected. Reductive dechlorination of DDT produced DDD, the major metabolite. The concentration of DDD increased to a maximum of 3.8 ppm at 36 hr after treatment. At 12 hr after feeding, DDT concentration fell below that of the DDD levels. Highest DDE concentration was reached at 12 hr. In no case did DDE reach the levels of DDT or DDD concentrations. *Phagocata velata*, though primarily an inhabitant of springs and spring-fed brooks and marshes, does occur in temporary pools and streams, under which conditions it is generally asexual and able to fragment and encyst under drought, later excysting and regenerating on return of water. Its ability to withstand unfavorable conditions may enable it to tolerate high levels of DDT concentration. Since many organisms feed on planarians, biological magnification may occur. The occurrence of DDD and DDE in *Phagocata velata* suggests the presence of microsomal oxidase.

75-0127. Sherman, J. C.; Nevin, T. A.; Lasater, J. A. (Oceanography Dept. Florida Inst. Technol., Melbourne, FL 32901). **Hydrogen sulfide production from Ethion by bacteria in lagoonal sediments.** *Bull. Environ. Contam. Toxicol. 12(3): 359-365; 1974.* (14 references)

This report describes the production of hydrogen sulfide in ethion enriched lagoonal sediments and by bacterial subcultures derived therefrom. Fourteen sediment samples were taken from the Indian River, a saline lagoon, between Cape Kennedy and Vero Beach. Ethion is a sulfur containing compound and conditions in the river indicated the presence of sulfur utilizing bacteria. Ethion enriched samples were the source of microorganisms for the experiments. Upon enrichment, 3 of the 14 sample sediments demonstrated significantly increased levels of sulfides after incubation. The rate of degradation in the sediments is not rapid. The sediments with added ethion were subcultured in thioglycollate tubes with added ethion. These subcultures were then inoculated into nutrient agar tubes into which iron wire had been added. If bacterial degradation of the ethion occurred, the wire would serve as a source of iron to produce iron sulfide. Iron sulfide was observed in 5 different samples. These same five samples also produced iron sulfide from sodium sulfate and iron wire. Experiments indicated the bacteria are members of the genus *Clostridium*. In all but 3 of the 14 samples, the sulfide concentration increased to some extent after exposure of the sediments to ethion.

75-0128. Wright, F. C.; Younger, R. L.; Riner, J. C. (U.S. Livestock Insects Lab., ARS, USDA, Kerrville, TX 78028). **Residues of mercury in tissues and eggs of chickens given oral doses of Panogen 15.** *Bull. Environ.*

Contam. Toxicol. 12(3): 366-372; 1974. (11 references)

A group of 3 roosters and 10 hens received 0.5 mg/kg mercury as Panogen 15 daily. Tissue analysis showed the kidney had the greatest residue followed by the liver, breast muscle, brain, heart, and ovaries. After dosing had stopped, the residues in both hens and roosters decreased to less than 4.0 ppm at 100 days. Residues in controls were less than 0.3 ppm throughout the study. In eggs from treated hens, about 90% of the residue was located in the albumin and the remainder in the yolk. Mercury residues of chickens hatched from eggs of treated hens showed that the dosing caused greatest residues in the kidney and liver. Two hens in the group given mercury died, one after 42 and the other after 90 doses. For 3 days prior to death they became completely anorexic. Leg weakness developed, and the chickens were unable to stand. Both showed severe loss of weight. About 50% of the chickens hatched after the third week of the study had clinical signs of mercurial poisoning at hatch or by 3-5 days after hatch. They developed weakness, incoordination, and tremors of peripheral musculature. Hatchability of fertile eggs of treated hens declined to 30% whereas the control value was 80%. After the first 7 weeks of the study, egg production declined to 19% of pretreatment values. The dosed hens which did manage to maintain relatively high egg production had relatively low residues of mercury in their tissues, suggesting that eggs may be a possible pathway for the elimination of mercury from their bodies.

75-0129. Clement, J. G.; Okey, A. B. (Dept. Biol., Univ. Windsor, Ontario, Canada). **Reproduction in female rats born to DDT-treated parents.** *Bull. Environ. Contam. Toxicol. 12(3): 373-377; 1974.* (18 references)

Reproductive performance of Wistar rats exposed to DDT isomers in utero and via the mother's milk has been studied to determine whether these natural routes of exposure during critical development periods might produce reproductive disorders. Male and female rats received diets containing 0, 20, 200, or 1000 ppm of *o,p'*-DDT or 0, 20, 200, or 500 ppm of *p,p'*-DDT. Partners receiving the same treatment were caged together. DDT diets continued during pregnancy and lactation. Growth was depressed in pups nursing on dams fed 200 or 500 ppm *p,p'*-DDT. Offspring born to dams fed 500 ppm *p,p'*-DDT died by 10 days after birth. In those who survived the nursing period, the growth depression was reversible on standard diets. At 80 days of age, all females were cycling normally. After mating with control group males at age 105 days, all females produced litters except those from mothers which had received 1000 ppm *o,p* -DDT. Of the four mated females in the 1000 ppm group, ovaries of two were sterile and contained cystic structures. These results suggest that the polycystic ovary syndrome is inducible only by *o,p'*-DDT doses far in excess of those available in the biosphere. Thus, reduction in the reproductive capacity of small rodents by DDT exposure seems to be achieved largely by increased neonatal mortality rather than by a single specific effect at one point in the reproductive cycle.

75-0130. Bradley, R. L.; Shoemaker, J. P.; Hoffman, Jr., R. V. (VA Hosp., Lexington, KY). **Treatment of experimental mammary adenocarcinoma with herbicides.** *Cancer Chemother. Rep. Part 1 58(5): 745-748; 1974.* (2 references)

Three groups of adult male C3H mice were inoculated s.c. with 50-60 mg C3HBA tumor. Group I received diphenamid, a mitosis inhibitor, and group II received picloram, a protein synthesis inhibitor, each at 10 or 20 mg/kg, s.c. Group III served as controls. At the 10 mg/kg dose level, picloram treated rats showed the least increase in tumor size. No significant differences in survival times were noted. At the 20 mg/kg dose level picloram and diphenamid treated tumors were consistently smaller than controls. Control mice survived an average of 51.3 days; the diphenamide group, 44.1 days; and of the 18 picloram treated rats, 3 were still alive at the end of the study on day 82. Of these 3 remaining mice, 2 no longer had tumors and appeared cured (11%). LD50 dosage was determined to be 30 mg/kg for picloram and about 95 mg/kg for diphenamid. No toxic effects were noted in the tissues of normal mice receiving experimental dose levels of the drugs. Severe fatty metamorphosis was noted in livers of mice receiving lethal dosages of either drug. The chemotherapeutic potential of herbicides should be explored.

75-0131. Kilzer, L.; Detera, S.; Weisgerber, I.; Klein, W. (Institut fuer oekologische Chemie, Gesellschaft fuer Strahlen- und Umweltschutz mbH, Munich, Germany). **Beitraege zur oekologischen Chemie LXXVII. Verteilung und Metabolismus des Aldrin-Dieldrin-Metaboliten Trans-4,5-dihydroxy-4,5-dihydroaldrin-^{14}C in Salatpflanzen und Boden. [Contributions to ecological chemistry Part 77. Distribution and metabolism of the aldrin-dieldrin metabolite trans-4,5-dihydroxy-4,5-dihydroaldrin-^{14}C in lettuce plants and soil.]** *Chemosphere 3(4): 143-148; 1974.* (16 references) (German)

The metabolism of ^{14}C-labeled trans-4,5-dihydroxy-4,5-dihydroaldrin (aldrin-trans-diol), a metabolite of aldrin and dieldrin, was studied in lettuce plants and in soil. Four weeks after application of aldrin-trans-diol to lettuce leaves, practically all radioactivity was found in the methanol extract in a non-extractable form. Most of the radioactivity was on and in the leaves. While the rinsing solution contained almost exclusively unchanged aldrin-trans-diol, the methanol extracts contained large proportions of hydrophilic metabolites, a few per cent nonpolar metabolites, and some unextractable metabolites. The nonpolar metabolite fraction was composed of one unidentifiable substance; the hydrophilic fraction was composed of at least four

radioactive substances with dihydrochlordene dicarboxylic acid as the principal metabolite accounting for 8% of the total radioactivity. In soil, 90.7% of the radioactivity input was recovered after 7 weeks. One third of the radioactivity was present in the methanol extract and almost two thirds in the aqueous ammonia extract. The methanol extract contained unchanged aldrin-trans-diol, hydrophilic metabolites and one nonpolar fraction; the ammonia extract contained practically hydrophilic metabolites only. Aldrin-trans-diol comprised 10.4% of the soil residues; 83.4% hydrophilic metabolites (mostly dihydrochlordene dicarboxylic acid), 3.2% nonpolar substances, and 3.0% radioactive residue were found in the soil.

75-0132. Vockel, D.; Korte, F. (Organisch-Chemisches Institut, Bonn University, Bonn, Germany). **Beitraege zur oekologischen Chemie LXXX. Versuche zum mikrobiellen Abbau von Dieldrin und 2,2'-Dichlorbiphenyl. [Contributions to ecological chemistry, Part 80. Studies on the microbial degradation of dieldrin and 2,2'-dichlorobiphenyl.]** *Chemosphere 3(5): 177-182; 1974.* (7 references) (German)

The microbial degradation of ^{14}C-labeled dieldrin and 2,2'-dichlorobiphenyl was studied in cultures containing microorganisms from soils contaminated with aldrin or other organochlorine compounds, or *Pseudomonas marginalis, P. fluorescens, P. syringae, P. morsprunorum*, 64 and 58, *P. glycinea*, and *Neurospora* species. The cultures contained at least 200 ppm aldrin, 650 ppm dieldrin, and 155 ppm of various organochlorine compounds. Photodieldrin and the aldrin metabolites, dihydroaldrin-4,5-transdiol and dihydrochlordene-1,3-dicarboxylic acid, were identified by thin-layer chromatography. Traces of 4-ketoaldrin (Matsumura's metabolite G) were detected by the combination of gas-chromatography with mass spectrometry.

75-0133. Lay, J. P.; Klein, W.; Korte, F. (Inst. fuer oekologische Chemie, Gesellschaft fuer Strahlen- und Umweltforschung mbH, Munich, Germany). **Beitraege zur oekologischen Chemie LXXXV. Mikrosynthese und in vitro Metabolismus von Dihydrochlorden-Dicarbonsaeure-^{14}C durch Rattenleberorganellen. [Contributions to ecological chemistry, Part 85. Microsynthesis and in vitro metabolism of dihydrochlordene-dicarboxylic acid-^{14}C by rat liver organelles.]** *Chemosphere 3(5): 193-198; 1974.* (9 references) (German)

The metabolism of ^{14}C-labeled dihydrochlordene dicarboxylic acid (4,5,6,7,8,8-hexachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene-1,3-dicarboxylic acid), regarded earlier as the final metabolite of aldrin, dieldrin, and trans-dihydroxy-dihydro-aldrin, was studied in rat liver homogenates obtained by centrifugation at 9,000 and 34,000 rpm. TLC, GC, and mass spectrometry procedures detected two mono-dechlorinated isomers of dihydrochlordene dicarboxylic acid, principal metabolites, and a highly hydrophilic metabolite; the latter could not be methylated.

75-0134. Sandrock, K.; Bieniek, D.; Klein, W.; Korte, F. (Institut fuer oekologische Chemie, Gesellschaft fuer und Umweltforschung mbH, Munich, Germany). **Beitraege zur oekologischen Chemie LXXXVI. Isolierung und Strukturaufklaerung von Kelevan-^{14}C-Metaboliten und Bilanz in Kartoffeln und Boden. [Contributions to ecological chemistry, Part 86. Isolation and structural resolution of ^{14}C-kelevan metabolites and balance in potatoes and soil.]** *Chemosphere 3(5): 199-204; 1974.* (2 references) (German)

The metabolism of ^{14}C-labeled kelevan in potatoes and soil was studied 11 weeks and one year plus 11 weeks after application on leaves. Kelevan acid (principal metabolite), non-metabolized kelevan, kepone, and kepone acetic acid were identified in the soil 11 weeks after application. While over 90% of the applied quantity was metabolized during the first crop growth period, these metabolites were products in which the side chain was shortened or eliminated without apparent changes in the carbon skeleton. Kepone acetic acid was identified as the principal metabolite in the soil after one year.

75-0135. Weisgerber, I.; Detera, S.; Klein, W. (Institut fuer Oekologische Chemie, Gesellschaft fuer Strahlen- und Umwelftforschung mbH, Munich, Germany). **Beitraege zur oekologischen Chemie LXXXVIII. Isolierung und Identifizierung einiger Heptachlor-^{14}C-metabolite aus Pflanzen und Boden. [Contributions to ecological chemistry, Part 88. Isolation and identification of some C-heptachlor metabolites from plants and soil.]** *Chemosphere 3(5): 221-226; 1974.* (5 references) (German)

The metabolism of ^{14}C-labeled heptachlor was studied in cabbage and soil. Following extraction and thin-layer chromatographic clean-up, the metabolites were identified by gas-liquid chromatography and mass spectrometry. After application to cabbage leaves, 1-hydroxychlordene and prillic acid were identified as hydrophilic metabolites accounting for 70% of the total radioactivity. The metabolites found in soil were hydroxy-dihydroheptachlor, 1-methoxychlordene, 1-hydroxychlordene, and heptachlor epoxide.

75-0136. Truhaut, R.; Hien Do Phuoc; Nguyen Phu Lich (Lab. de Toxicol. et d'Hyg. Industrielle, Univ. Rene-Descartes, Paris, France). **Influence de l'administration de pesticides organo-halogenes et de polychlorobiphenyls sur le metabolisme de zoxazolamine chez le Rat. [Influence of the administration of organohalogen pesticides and polychlorinated biphenyls on the metabolism of zoxazolamine in the rat.]** *C. R. Acad. Sci. Paris Ser. D 278(23): 3003-3006; 1974.* (10 references) (French)

The effects of 19 different pesticides and 3 PCBs on the metabolism of zoxazolamine, i.e., on zoxazolamine dehydrogenase, were studied in male Sprague-Dawley rats. The animals were administered 2 to 20 mg/kg doses of the pesticides i.p. on three occasions at 24 hr intervals; a 70 mg/kg dose of zoxazolamine subsequently was administered i.p. on the fourth day. The effect of the pesticides was determined by measuring the duration of the zoxazolamine-generated paralysis. The inductive power of the pesticides and PCBs decreased in the order PCB, aldrin, *p,p'*-DDE, heptachlor, dieldrin, endrin, *p,p'*-DDMU, *p,p'*-DDT, folpet, *p,p'*-DDD (TDE), chlordane, *α*-BHC, *p,p'*-DDT, *β*- and δ-BHC, and lindane. The intensity of the inhibitory effect on the zoxazolamine dehydrogenase decreased in the order captan, methoxychlor, difolatan, and endosulfan. Nearly all pesticides found to be potentially carcinogenic (aldrin, dieldrin, and DDT) were active inductors. Except for methoxychlor, all compounds with one or more aromatic rings exhibited very high activity. The presence of halogens, especially of chlorine, frequently promoted the inductive activity. The differences in the activities of BHC isomers as well as of dieldrin and endrin are indicative of the significance of the spacial orientation of the chlorine atoms. Certain compounds, such as PCBs, *p,p'*-DDE, endrin, aldrin, and dieldrin had inductive activity equivalent to that of polycyclic aromatic hydrocarbons. However, they exert their effect on zoxazolamine dehydrogenase more slowly than the latter hydrocarbons.

75-0137. Doneche, B. (Inst. d'Oenologie, Talence, France). **Effects du "Mancozebe" sur la microflore des sols du vignoble bordelais. Premiers resultants. [Effects of mancozeb on the microflora of the soils of the vineyards in the Bordeaux region. First results.]** *C. R. Acad. Sci. Paris Ser. D 278(23): 3011-3014; 1974.* (8 references) (French)

The effects of mancozeb on the microflora in soil samples taken from vineyards in the Bordeaux area were studied by a laboratory microbiological method. Mancozeb was added at a rate of 8 mg/kg to liquid media for algae and total microflora and at 25 mg/kg to solid media for actinomycetes and fungal cutures. In another treatment mancozeb was applied in doses of 5 mg/kg for liquid and 25 mg/kg for solid media, with reduced metabolite content in both cases. Mancozeb considerably reduced the total microflora and fungal population. Algae and actinomycetes were less sensitive to mancozeb than fungi. Thus, mancozeb caused partial sterilization of the soil and proliferation of resistant species for a limited time. In liquid medium, mancozeb was detectable in proportions amounting to 4.3-11% of the input at the end of one month.

75-0138. Iturri, S. J. (Michigan State Univ., East Lansing, MI). **The effects of various chlorinated hydrocarbons on the cardiovascular physiology and hematology of the domestic fowl.** *Diss. Abstr. Int. 35(3): 1371B; 1974.*

A study was carried out to determine the effects of DDT, endrin, and various polychlorinated biphenyls on cardiovascular physiology and hematology as well as some toxicological symptoms of the domestic fowl at both lethal and sublethal levels. A significant increase in hematocrit values and hemoglobin concentration were observed in female adult Single Comb White Leghorn chickens when DDT (2000 ppm) was incorporated into the diet. In contrast, endrin (16-20 ppm) caused a significant increase in these two parameters. Total erythrocyte concentration showed the same trend as HCT values and hemoglobin concentration. In acute dosage experiments endrin infusion (8 mg/kg body weight) produced marked bradycardia and hypertension. These cardiovascular changes were accompanied by convulsions and salivation, indicating stimulation of parasympathetic and sympathetic nervous systems. No significant differences in packed cell volume, total erythrocyte concentration, and hemoglobin concentration were observed before or after endrin infusion in SCWL females. Toxicologic symptoms observed in cockerels after chronic oral administration (50-200 ppm) of various PCBs included depressed body weight and feed intake; general edema and hydropericardium; increased liver weight and decreased heart, spleen, and testes weight; depression of sexual characteristics; and some mortality. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order no. 74-19,823)

75-0139. Kotev, T.; Papazova, M.; Andreyeva, S. (Inst. Physiol., Sofia, Bulgaria). **Promeni v bioelektricheskata aktivnost na stomakha i duodenuma u kucheta pri ostrite intoksikatsii s FOV i lechenie s preparat N-5 (T). [Bioelectric activity changes in the stomach and duodenum of dogs after poisoning with IMEF, PMFF and MEDETFK and subsequent treatment with N-5 (T) antidote.]** *Eksp. Med. Morfol. 12(2): 61-65; 1973.* (5 references) (Bulgarian)

Changes caused by acute poisoning with the organophosphorus compounds IMPF (sarin) as well as the unspecified compounds PMFF and MEDETFK in the bioelectric activity of the stomach and proximal duodenum of dogs, as well as the efficiency of the subsequent treatment with the N-5 (T) antidote preparation were studied. The i.m. or i.v. administered LD100 doses of the organophosphorus compounds caused an overall intensification of the motor activity of the stomach and duodenum, which manifested itself in the appearance of spike potentials, changes in the rhythm of the slow waves, the presence of antiperistalsis, and strongly pronounced spasms of the smooth musculature. These phenomena were effectively eliminated by i.m. injection of 1 mg/kg N-5 (T) within 3 to 5 min after injection.

75-0140. Rogers, J. G., Jr.; Cagan, R. H.; Kare, M. R. (U.S. Bur. Sport Fisheries and Wildlife, Patuxent Wildlife Res. Cent., Laurel, MD 20810). **Percutaneous absorption of several chemicals, some pesticides included, in the red-winged blackbird.** *Environ. Physiol. Biochem. 4(3): 104-111; 1974.* (18 references)

A qualitative in vivo technique for measuring absorption through the skin of birds' feet is described. The absorption of 2,4-D, dieldrin, salicylic acid, caffeine, urea, and diethylstilbestrol through the skin of the feet of the red-winged blackbird (*Agelaiuu phoeniceus*) was studied. Feet were immersed in plastic vials containing 3-6 ml of the penetrant at known specific radioactivity. After decapitation of the birds triplicate samples of blood collected from each were analyzed for radioactivity. Blood level of 2,4-D was approximately 55 X 10^{-3} mg/kg and of dieldrin approximately 2.3 X 10^{-3} mg/kg, both well below the avian LD50 for these compounds. DDT was not absorbed to a measurable degree. Partition coefficients (K) (epidermis/water) were determined for all seven compounds. Compounds with higher K values showed lower percutaneous absorption.

75-0141. Dishovski, Kh. D.; Kagan, Yu. S.; Kovtun, S. D. (Lab. General Toxicol., All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Elektrofiziologicheskiy analiz deystviya reaktivatora, dipiroksima pri ostroy intoksikatsii *O,O*-dimetil-2,2-dikhlorvinilfosfatom. [Electrophysiological analysis of the action produced by the reactivator dipyroxime in acute poisoning with *O,O*-dimethyl-2,2-dichlorovinylphosphate.]** *Farmakol. Toksikol. (Moscow) 37(3): 365-367; 1974.* (16 references) (Russian)

The effect of dipyroxime and DDVP (dichlorvos) on the miniature potentials of the lamina terminalis in the neuromuscular synapse of the albino rat tail was studied in vivo by electrophysiological analysis, using intracellular registration. The single, i.m. 20 mg/kg dose of dipyroxime did not change the amplitude of the potential, but reduced its frequency. Following oral administration of a single 70 mg/kg dose of DDVP, the amplitude first increased, then later fell below the control value. The frequency increased right after administration and between the 60th and 90th minutes following administration. After simultaneous administration of DDVP and dipyroxime, the initial increments of the amplitude and frequency were always less marked than in the case of DDVP administration alone. The amplitude became normalized with time, while the frequency declined considerably. DDVP totally inhibited the acetylcholinesterase activity. Acetylcholinesterase activity normalized 60 min after joint application of DDVP and dipyroxime. Large doses of DDVP interfered with the function of the presynaptic and postsynaptic membranes.

75-0142. Komisarenko, V. P.; Tron'ko, M. D. (Lab. Pathophysiol., Kiev Inst. Endocrinol. and Metabolism, Kiev, USSR). **Vpliv *o,p'*-DDD na obmin gidrokortizonu u shchuriv i sobak. [Effect of *o,p'*-DDD on hydrocortisone metabolism in rats and dogs.]** *Fiziol. Zh. (Kiev) 19(6): 765-768; 1973.* (12 references) (Ukrainian)

The effect of *o,p'*-DDD (TDE) on hydrocortisone metabolism was studied in dog liver and in the liver and kidney of rats. Liver and kidney homogenates were incubated with hydrocortisone after the dogs and rats were fed 50 mg and 300 mg *o,p'*-DDD per kg, respectively, for 14 days. The hydrocortisone metabolism was studied by thin-layer chromatography on silufol plates. Administration of 300 mg *o,p'*-DDD per kg intensified the hydrocortisone metabolism in rat liver due to the increased rate of formation of hydrated A rings. Tetrahydrocortisone, allo-tetrahydrocortisone, hydrocortisone, cortisone, and two unidentified metabolites were detected in rat liver homogenates. The administration of 50 mg *o,p'*-DDD per kg to dogs failed to change the hydrocortisone metabolism. Stimulation of the metabolism of hydrocortisone into cortisone was observed in rat kidney.

75-0143. Dubovoy, V. P.; Chkanikov, D. I.; Makeyev, A. M. (All-Union Sci. Res. Inst. Phytopathology, Bol'shiye Vyazemy, Moscow Region, USSR). **Nekotoryye osobennosti dekarboksilirovaniya 2,4-D v rasteniyakh. [Decarboxylation of 2,4-D in plants.]** *Fiziol. Rast. 20(6): 1261-1267; 1973.* (22 references) (Russian)

The decarboxylation of ^{14}C-labeled 2,4-D was studied in 18 different plant species, including sunflower, mustard, cotton, cucumber, soybean, bean, pea, wheat, corn, and strawberry, in a 96 hour-test. No correlation was established between the resistance of the plants to 2,4-D and the rate of decarboxylation. Nevertheless, the decomposition of the side chain is assumed to be an important route of detoxication of this herbicide in some plants like strawberries. The rate of radioactive CO^2 release in the plants treated with 2,4-D-1-^{14}C was higher during night than during day due to the trapping of CO^2 formed during the day and its utilization in the synthesis of endogenous compounds. The rate of radioactive CO^2 release from plants treated with 2,4-D-^{14}C was the same as that of accumulation of labeled 2,4-dichlorophenol in the plants treated with the herbicide labeled in the ring. Degradation of the side chain of 2,4-D is assumed to begin with hydrolysis of the ester bond, yielding 2,4-dichlorophenol and acetate. The rate of 2,4-D dealkylation was higher in the leaves than in any other organ of the plants.

75-0144. Demidenko, N. M.; Mirgiyazova, M. G. (Tashkent Med. Inst., Tashkent, USSR). **Sochetannoye vliyaniye na organizm vysokoy temperatury i pestitsida antio. [Combined effect of high air temperature and anthio pesticide on the body.]** *Gig. Sanit. 39(7): 18-21; 1974.* (3 references) (Russian)

The combined effect of high temperature (36-40 C) and anthio (formothion) was studied in rabbits and albino rats. Reduced cholinesterase activity, increased potassium and sodium levels, and reduced chlorine levels in the plasma were noted in the experimental animals as well as in workers exposed to low concentrations of anthio at high ambient temperature. The changes in the above parameters were 150 to 200% more intense in the animals fed anthio in doses amounting to 1/50, 1/300, 1/500, and 1/5000 LD50 and exposed to high temperature for 2 hr daily (8 month-experiment) than in groups exposed to either anthio or high temperature alone. Also, the poisoning symptoms appeared earlier and the mortality was higher in the group under combined exposure. While the 1/5000 LD50 dose was ineffective in the group exposed to high temperature only, it reduced the cholinesterase activity in the group exposed to both anthio and high temperature.

75-0145. Vozovaya, M. A. (Dept. Obstetrics and Gynecology, Bashkir Med. Inst., Ufa, USSR). **O razvitii potomstva dvukh pokoleniy, poluchennykh ot samok, podvergavshikhsya vozdeystviyu dikhloretana. [Development of posterity of two generations obtained from females subjected to the action of dichloroethane.]** *Gig. Sanit. 39(7): 25-28; 1974.* (4 references) (Russian)

The effect of dichloroethane on the embryonal and postembryonal development was studied in female rats exposed to a dichloroethane concentration of 57 ± 10 mg/m^3 for 6 months and then during the entire pregnancy. While dichloroethane produced no general toxic symptoms in the female rats, it interfered with embryogenesis and fetal development, manifesting itself in reduced fertility, reduced weight at birth, and increased stillbirth rate. Reduced viability in the rats obtained from the females exposed to dichloroethane, and, among the females in this generation, retarded gain in weight, prolonged estrous period, and high perinatal mortality were observed. No deviations in the development of the third generation were noted. It is suggested that female workers not be exposed to this pesticide during pregnancy.

75-0146. Vorob'yeva, N. M.; Lapchenko, V. S. (Kiev Sci. Res. Inst. Food Hyg., Kiev, USSR). **Gigiyenicheskoye obosnovaniye predel'no dopustimykh kolichestv pestitsida amifos. [Hygienic substantiation of the maximum permissible amount of amiphos pesticide.]** *Gig. Sanit. 39(7): 34-37; 1974.* (Russian)

The maximum allowable amiphos (DAEP) residue concentration in foods was determined on the basis of acute and chronic poisoning tests. The acute oral LD50 values were determined as 146 ± 17.7 mg/kg in mice, 475±56 mg/kg in albino rats, and 410±55.7 mg/kg in cats. Subchronic experiments with 1/10, 1/20, and 1/50 of LD50 for four months revealed weak cumulative action of amiphos. Reduction of the cholinesterase activity, change in the protein synthesis in the liver, and change in the vitamin C levels in the liver and kidney were observed in the subchronic and chronic experiments. Daily 20, 4, and 0.8 mg/kg doses administered to rats for 8 months caused dose-dependent reductions in the cholinesterase activity, especially in the brain and serum. The rate of cholinesterase inhibition was lowest in the liver and kidney. The lowest effective and highest no-effect levels were 0.8 and 0.4 mg/kg, respectively. On the basis of the toxicological findings, the maximum allowable amiphos concentration in food products, mainly fruits and vegetables, should be 0.3 mg/kg.

75-0147. Shtenberg, A. I.; Torchinskiy, A. M. (Inst. Nutrition, Acad. Med. Sci. USSR, Moscow, USSR), **Nekotoryye aspekty gigiyenicheskogo izucheniya teratogennogo deystviya postoronnikh dlya organizma veshchestv, soderzhashchikh v produktakh pitaniya. [Certain aspects of hygienic research on the teratogenic action of substances foreign to the body and contained in food products.]** *Gig. Sanit. 39(7): 37-42; 1974.* (15 references) (Russian)

General methodological problems and the significance of the teratologic experiment in the complex hygienic and toxicological investigation of pesticides and drugs are discussed, and an improved test schedule is proposed. The observed dependence of the teratogenic action of pesticides and other chemicals on the dose, on the schedule of application, and on the species and even the strain calls for a test schedule in which the teratologic test, along with the cumulation test, follows immediately after the determination of the LD50. Also, the pesticides should first be applied in large doses to facilitate distinguishing between spontaneous and induced malformations. Then, the dose should be gradually diminished to the ineffective level. The teratological tests should be performed during the entire pregnancy, during the pre-implantational period, and during the period of organogenesis.

75-0148. Shchitskova, A. P. (Moscow F. F. Erisman Sci. Res. Inst. Hyg., Moscow, USSR). **Nekotoryye aspekty otsenki spetsificheskogo deystviya na organizm pestitsidov. [Some aspects of evaluation of specific effects of pesticides on living organisms.]** *Gig. Sanit. 39(8): 76-78; 1974.* (Russian)

Studies on the specific immunologic, mutagenic, and teratogenic effects of pesticides and other substances are reviewed. Inhibition of the spontaneous immunity, accumulation in the blood of autoantibodies, reduction of the immune-biological reactivity, and

changes in the skin microflora due to certain pesticides like zineb and trichlorfon were observed. Ziram and Zineb permanently damaged the ovogenesis and spermatogenesis in rats and caused almost total sterility of males and females, reduced number of fetuses, resorption, high postnatal lethality, and retarded growth. Rats and mice chronically poisoned with trichlorfon and zineb had reduced cell mitotic activity and increased frequency of chromosomal aberrations and mutations, occurring especially during the early phases of the spermatogenesis.

75-0149. Konstantinova, T. K. (Sci. Res. Inst. Rural Hyg., Saratov, USSR). **Vliyaniye gerbitsida butilovogo efira 2,4,5-T na materinskiy organizm i razvitiye ploda v eksperimente. [Experiments on the effects of 2,4,5-T butyl ester on pregnant animals and on the development of their offspring.]** *Gig. Sanit. 39(8): 101-102; 1974.* (6 references) (Russian)

The general toxic and embryotoxic effects of 2,4,5-T butyl ester were studied in pregnant albino rats and their fetuses. The animals were fed daily 4.2 mg/kg, 0.42 mg/kg, 0.1 mg/kg, and 0.01 mg/kg 2,4,5-T butyl ester during their entire pregnancies. Disturbances of the function of the central nervous system; eosinopenia; increase in the relative weight of the brain, liver, and kidney with pathomorphological changes in these organs; pronounced embryotropic effect, manifesting itself in reduced fetal weight; increased embryonal lethality; and pathomorphological changes in the fetal tissues and organs were observed in pregnant rats and in their offspring when fed 4.2 mg/kg doses. The above symptoms were less pronounced in the groups including offspring that were fed daily 0.42 and 0.1 mg/kg doses of 2,4,5-T butyl ester. The dose of 0.01 mg/kg caused no changes in the maternal and fetal organisms and can be consequently regarded as an ineffective dose concerning embryotoxicity. The 0.1 mg/kg dose was determined as the threshold dose.

75-0150. Rosival, L.; Barlogova, S.; Grunt, Yu. (Inst. Hyg., Bratislava, Czechoslovakia). **Vliyaniya lindana na nekotoryye immunologicheskiye reaktsii krys. [Effect of lindane on certain immunological reactions in rats.]** *Gig. Tr. Prof. Zabol. 6: 53-55; 1974.* (6 references) (Russian)

The effect of parenterally administered 120 and 60 mg/kg doses of lindane on the phagocytic activity of the neutrophils and the specific antibody formation against human serum albumin was studied in rats. Conditionally pathogenic *Escherichia coli* No. 064 was used for the experiments. Lindane in 120 and 60 mg/kg doses suppressed the specific antialbumin antibody formation. The 120 mg/kg doses inhibited both the phagocytic and the digestive phases of the phagocytosis.

75-0151. Sizonenko, P. C.; Doret, A. M.; Riondel, A. M.; Paunier, L. (Cantonal Hosp., Geneva, Switzerland). **Cushing's syndrome due to bilateral adrenal cortical hyperplasia in a 13-year old girl: Successful treatment with *o,p'*-DDD.** *Helv. Paediat. Acta 29(3): 195-202; 1974.* (10 references)

A 13 year old female suffering from bilateral adrenal hyperplasia and Cushing's syndrome was treated with *o,p'*-DDD (TDE), one g, 3 times/day. After 20 days, the plasma cortisol levels were low. Dosage of *o,p'*-DDD was reduced to 2 g/day, and prednisone (7.5 mg/day) was instituted. The *o,p'*-DDD therapy lasted 6 months. Side effects consisted of occasional vomiting in the evenings. This patient developed complete adrenal insufficiency affecting not only the cortisol, but also aldosterone secretion following a relatively small dose of *o,p'*-DDD. The mode of action of the drug is the alteration of cortisol metabolism, particularly the pattern of excretion of the urinary metabolites. Aldosterone secretion was low several months after the beginning of therapy. It is suggested that this therapy is the medical equivalent of bilateral adrenalectomy with surgery still possible in case of failure. No recurrence has been noted in the 18 months following cessation of the *o,p'*-DDD therapy.

75-0152. Agnihotri, V. P. (Indian Inst. Sugarcane Res., Lucknow, India). **Effect of Dexon on soil microflora and their ammonification and nitrification activities.** *Indian J. Exp. Biol. 11(3): 213-216; 1973.* (21 references)

Composite soil samples were taken from a depth of 6 in. from a nursery. The organic content of the soil was 3.5%, and the pH was 6.4. Experiments were conducted using 100 g of soil and different amounts of Dexon (sodium *p*-dimethylaminobenzenediazosulfonate, diazoben). The recommended use concentrations, 10.9-43.7 ppm, did not alter the number of fungi, actinomycetes, and bacteria. Concentrations of 87.5-350 ppm decreased the total population of fungi. Dexon at 350 ppm reduced the actinomycetes population by day 7. The effect on spore-forming and non-spore forming bacteria was not significant nor was it consistent. The number of *Pythium* propagules generally decreased as the concentration of Dexon increased. Dexon at 175 and 350 ppm eliminated *Pythium* from the soil. *Mortierella* species were resistant to Dexon. Growth and sporulation of all 3 *Mortierella* species on potato-dextrose-agar medium were unaffected by even 300 ppm Dexon concentrations. Low doses of Dexon did not affect nitrate formation. However, as the fungicide concentration increased, nitrification was inhibited as evidenced by an accumulation of ammonium nitrogen. This build up of ammonia following Dexon treatment is advantageous to sugarcane settlings as they prefer ammonium nitrogen to nitrate nitrogen.

75-0153. Schricker, B. (WE Zoologie I, Freie Universitaet Berlin, Berlin, Germany). **Der Einfluss sublethaler**

Dosen von Parathion (E 605) auf das Zeitgedaechtnis der Honigbiene. [The effect of sublethal doses of parathion E-605 on the chronological memory of the honey bee.] *Insectes Sociaux 19(4): 411; 1972.* (1 reference) (German)

Disturbance in the chronological memory of trained honey bees due to poisoning with a sublethal dose of less than 0.03 μg parathion was observed. The disturbance manifested itself in the appearance of the bees at the feeder ahead of the usual time by 1 to 2 hr on the following day.

75-0154. Desi, I. (Natl. Inst. Public Health, Dept. Toxicol., Budapest, Hungary). **Neurotoxicological effect of small quantities of lindane.** *Int. Arch. Arbeitsmed. 33: 153-162; 1974.* (17 references)

Experiments were conducted to study the early effects of low doses of lindane on the different functions of the central nervous system in Wistar R rats using dose levels of 2.5, 5, 10, and 50 mg/kg. Performance in maze experiments deteriorated by the 12th day, the pronounced worsening being followed by an improvement, then by another deterioration. Some balance may have been established between intake and excretion during the experiment, but this was disrupted by further feeding. From day 28 onward, rats given 5 mg/kg had almost the same running time as controls, although they had more errors, for they ran faster. Thus lindane, in low doses, has a stimulating effect. At higher doses, the animals became more frequent in their errors and decreased speed as well. Animals receiving 2.5 mg/kg showed no effects to day 22 when that particular test was terminated. However, in the Skinner box tests, striking differences were noted even in the 2.5 mg/kg group, thus indicating that the performance of the more difficult task was influenced by the lower dose. The Skinner box performance indicated that the irritability of the animals was increased. No abnormalities in the liver function were noted even in the highest dose group. Only in the highest dose group could differences in body weight be seen. These negative results of the morphological studies suggest that functional neurophysiological tests are even more sensitive than the histopathological examinations of the organs most often affected. It is suggested that neurological monitoring of persons exposed to lindane may be of value.

75-0155. Skryabin, G. K.; Golovleva, L. A.; Strekozov, B. P.; Pribud'ko, N. V. (Institute of Biochemistry and Physiology of Microorganisms, Academy of Sciences USSR, Pushchino on the Oka, USSR). **Mikrobiologicheskaya transformatsiya gerbitsidov v sookislitel'nykh usloviyakh. [Microbiological transformation of herbicides under cooxidation conditions.]** *Izv. Akad. Nauk SSSR, Ser. Biol. 3: 353-360; 1974.* (10 references) (Russian)

Studies were made on the effects of ordram (molinate) and phenoxyalkanoic acid derivatives on the qualitative composition of the microflora in rice field and the degradation of these pesticides by the soil microflora under different conditions. Ordram, applied at a rate of 5 kg/ha, sharply reduced the fungal and bacterial populations during the first month only, while 2,4-D and 2-M-4-C (MCPA) reduced the bacterial population and slightly stimulated the fungi during the first 15 days. Strains extracted from soil or from museum collections did not utilize phenoxyalkanoic acid derivatives as a source of carbon in buffer solution. Under cooxidative conditions, i.e., in the presence of other carbon sources in the substrate, the microorganisms partly oxidized 2,4-D and 2-M-4-C without destroying the aromatic nucleus. The findings indicate that the degradation of the herbicides in the soil is caused by conditions necessary for cometabolic processes.

75-0156. Fries, G. F.; Marrow, G. S. (USDA, ARS, Agr. Environ. Quality Inst., Beltsville, MD). **Hexachlorobenzene excretion into milk of cows.** *J. Anim. Sci. 39(1): 155; 1974.*

Two groups of 3 cows each were fed 5 and 25 mg hexachlorobenzene/day for 60 days. Other cows received the same rate of 2,2-bis(*p*-chlorophenyl)-1,1-dichloroethane (DDE). Residues were determined at 5-day intervals in the milk and for 60 days after returning the cows to clean feed. The concentration of hexachlorobenzene rose more slowly during feeding, the ratio of DDE to hexachlorobenzene being 2:1 at 10 days and approaching 1:1 after 40 days. After returning to clean feed, the decline in hexachlorobenzene concentration could be described by a single-component first-order equation whereas a two-component first-order equation was needed for DDE. At 60 days concentrations of hexachlorobenzene and DDE in milk fat were 9.6 and 11.1 ppm, resp., with the 25 mg/day intake, and 2.2 and 2.3 ppm with the 5 mg/day intake. Corresponding values in tail-head fat were 9.0, 8.3, 1.9, and 1.5 ppm, resp., at 60 days. The half-lives ranged from 29 to 64 days and were inversely related to the level of milk fat production. The differences in behavior between the compounds are attributed to faster equilibration between diet and body fat by hexachlorobenzene. However, it is suggested that these short-term differences are not important enough to warrant different recommendations for handling contamination events involving hexachlorobenzene.

75-0157. DeKay, D. E.; Stanton, H. C.; Brown, L. J.; Mersmann, H. J.; Siers, D. G. (Shell Develop. Co., Biol. Sci. Res. Cent., Modesto, CA). **Cold stress and the dichlorvos litter response.** *J. Anim. Sci. 39(1): 181; 1974.*

One hundred lightly parasitized crossbred sows were randomly divided into two groups on gestation day 80. Each treated sow received 1,000 mg dichlorvos as a top dress on the daily feed until farrowing. This

maternal dichlorvos treatment increased the number of liveborn pigs and decreased the number of stillbirths per litter. The litters from dichlorvos-treated dams were heavier and contained more live pigs at 7, 14, and 21 days of age. Litters from treated dams maintained their advantage, and at 160 days of age the average treated litter was 45 kg heavier than the control. Some of the pigs had been exposed to 5°C, which significantly influenced every variable measured, including cholinesterase, glycerol, free fatty acids, CPK, lactate, and glucose. The only significant difference between control litters and those from dichlorvos treated dams was for CPK; litters from treated dams had lower CPK values at 34°C and at 5°C.

75-0158. Fogg, T. J.; Schooley, M. A.; Brown, L. J.; Chai, E. Y.; Keasling, H. H. (Shell Develop. Co., Biol. Sci. Res. Cent., Modesto, CA). **Factors affecting the litter dichlorvos response.** *J. Anim. Sci. 39(1): 182; 1974.*

The dams of treated litters received 700 to 1,000 mg dichlorvos/sow/day as a ration top dress. The first data set analyzed involved 24 experiments on 675 control litters and 668 treated litters in which treatment duration ranged from 20 to 50 days. Analysis showed that the mean litter weight increased 12.5%; location differences did not influence the percent response; and that previous gestation treatment did not alter the response to subsequent treatment. The second data set included the first one plus an additional 30 experiments including treatment durations outside the 20 to 50 day range. In this data set the total number of control litters was 1543; total treated litters, 1613. The analysis showed that the mean litter weaning weight increase was 11.7% and that the regression of the percent response on baby pig survival (determined by the number of live pigs divided by the total at birth) of the control litters was -.63.

75-0159. Keasling, H. H.; Schooley, M. A.; Collins, J. A.; Brown, L. J. (Shell Develop. Co., Biol. Sci. Res. Cent., Modesto, CA). **Dichlorvos and the litter weight response.** *J. Anim. Sci. 39(1): 184; 1974.*

The administration of dichlorvos as a top dress on ration fed to pregnant sows increases the weight of litters at birth, weaning, and market. Experiments involving 377 dams were performed to estimate the dose response relation of this effect. Analyses of variance showed no indication of an experiment-times-dose-level interaction, and all treatment groups had significantly higher litter weaning weights than did controls. The single anthelmintic dose had a positive effect, but was not significantly better than controls. Quadratic and Mitcherlich models were used to estimate the plateau point of the dose response curve. Both models gave similar empirical dose response curves and plateau points. A consistent and increasing dose response relationship over the range of doses tested, O to 3,300 mg/sow/day, was noted. The increased litter weaning weight response is 15% at the recommended dose of 1,000 mg/day. The plateau of the dose response curve is not reached until at least 1,500 mg/day. These results also suggest that total born (live plus dead) is not affected and that the response is not due to the anthelmintic action of dichlorvos.

75-0160. Siers, D. G.; Brown, L. J.; Chai, E. Y.; Schooley, M. A. (Shell Develop. Co., Biol. Sci. Res. Cent., Modesto, CA). **Components of the dichlorvos litter weight effect.** *J. Anim. Sci. 39(1): 189; 1974.*

A group of 203 sows received 800 mg dichlorvos/-day as a top dress on their daily ration (2.3 kg) during the last 21 to 30 days of gestation. The treatment effect was not significant for the total number born, dead plus live. The treatment did significantly increase the number born alive (2.3%), litter birth weight (9.3%), mean birth weight (11.6%), litter weaning weight (5.2%), mean weaning weight (11.1%), number weaned (16.5%), litter market weight (6.6%), mean market weight (6.0%), and the number marketed (12.4%). Additional analyses indicated that the treatment had highly significant effects on pig survival and growth rate after birth. Although post-weaning survival was not influenced, there is a suggestion of a positive effect on post-weaning growth rate.

75-0161. Knowles, C. O.; Aziz, S. A. (Dept. of Entomol., Univ. of Missouri, Columbia, MO 65210). **Metabolic fate of benzoyl chloride (2,4,6-trichlorophenyl)hydrazone (Banamite acaricide) in the two-spotted spider mite.** *J. Econ. Entomol. 67(5): 574-576; 1974.* (5 references)

The metabolism of radiocarbon-labeled benzoyl chloride (2,4,6-trichlorophenyl)hydrazone (Banamite) by *Tetranychus urticae* Koch was studied in vivo and in vitro. Banamite penetrated rapidly but was metabolized slowly by the mites. The major identified metabolites were benzaldehyde, 2-(2,4,6-trichlorophenyl)hydrazone; and benzoic acid, 2-(2,4,6-trichlorophenyl)hydrazide. Minor identified metabolites were 2,4,6-trichloroaniline, benzaldoxime, 2,4,6-trichlorophenylhydrazine, and benzoic acid. Several unidentified radioactive materials also were present. (Author abstract by permission)

75-0162. Werner, R. A. (USDA Forest Service, Southern Forest Exp. Sta., Forestry Sci. Lab., Research Triangle Park, NC 27709). **Distribution and toxicity of root-absorbed ^{14}C-Orthene and its metabolites in loblolly pine seedlings.** *J. Econ. Entomol. 67(5): 588-591; 1974.* (9 references)

Chromatographic and radiochemical analyses show that ^{14}C-Orthene (*O,S*-dimethyl *N*-acetyl phosphoramidothioate, acephate) was absorbed rapidly from

nutrient solution and distributed throughout 130-day-old loblolly pine seedlings within 1 hr after treatment. Orthene was converted to its primary metabolite, Monitor (*O,S*-dimethyl phosphoramidothioate, methamidophos), and an unknown compound which was insecticidally active against adult pales weevils, *Hylobius pales* (Herbst). Bioassays of treated seedlings indicated that highly toxic levels of Orthene remained in the needles 120 hr after treatment. (Author abstract by permission)

75-0163. Stone, R. B.; Coston, L. C.; Hoss, D. E.; Cross, F. A. (Author address not given). **Tire reefs: habitat improvement or pollution.** *J. Elisha Mitchell Sci. Soc. 89(4): 260-261; 1973.*

Changes in the levels of chlorinated hydrocarbons and heavy metals were measured in fish held under simulated artificial scrap tire reef conditions. Levels of polychlorinated biphenyls, DDE, DDD, DDT, dieldrin, Zn, Mn, Fe, and Cu were measured as examples of contaminants which might be introduced into the environment along with the scrap tires. Pinfish (*Lagodon rhomboides*) and black sea bass (*Centropristis striata*), each known to inhabit artificial tire reefs, were held in two 2,000-liter flowing sea water fiberglass tanks under identical conditions except that 6 scrap tires were added to one tank. No change was noted in the levels of polychlorinated biphenyls, insecticides, and trace metals. However, the sea bass were able to be maintained for only 29 days while pinfish in the same tank survived until the termination of the experiment at 101 days. Sea bass mortality may have resulted from handling procedures, dietary deficiencies, or changes in behavior caused by competition for the limited habitat provided by the tires.

75-0164. Breslow, N. E.; Day, N. E.; Tomatis, L.; Turusov, V. S. (Internat. Agency Res. Cancer, Lyon, France). **Associations between tumor types in a large-scale carcinogenesis study of CF-1 mice.** *J. Nat. Cancer Inst. 52(1): 233-239; 1974.* (11 references)

In a multigenerational carcinogenesis experiment DDT was placed in the diets of 720 CF-1 mice at concentrations of 2, 10, 50, and 250 ppm. Crude associations between tumor types found at necropsy involving over 4000 CF-1 mice in certain cases arose spuriously from the grouping of animals by treatment and/or from similarities in the age-specific tumor prevalence curves. However, when adjustments were made for these factors, statistically significant associations remained. Lymphomas were negatively related to hepatomas, lung adenomas, and mammary and ovarian tumors. With the possible exception of the relation between hepatomas and lymphomas, negative associations may be due to the relatively rapid rate with which lymphomas kill their bearers. The lone positive relation, between lymphomas and bone tumors, may reflect a common viral etiology.

75-0165. Young, R. C. (Dept. Biol., Tennessee Technol. Univ., Cookeville, TN). **The use of manometric techniques in screening potentially environmental hazardous materials.** *J. Tenn. Acad. Sci. 49(2): 57; 1974.*

Environmentally hazardous materials have been subjected to extensive research by aquatic biologists and toxicologists. Since respiration or cellular oxidation is common to all life forms, it is thus an excellent parameter in monitoring biological systems. In 1926, Warburg developed a device based on manometric principles which followed the rate of oxygen utilization from a closed system. Hazardous materials have been tested using heterogenous bacterial cultures and homogenized fish tissue as biological indicators under this basic Warburg technique. The data obtained was subsequently evaluated by respiration rate plots. Compounds tested were classified as nontoxic (biodegradable), non-toxic (nonbiodegradable), variable (non-toxic biodegradable at low concentrations but toxic at high concentrations), or toxic at all levels tested.

75-0166. Mel'nikov, N. N. (All-Union Sci. Res. Inst. Chemical Plant Protection Agents, USSR). **Pestitsidy i okruzhayushchaya sreda. Razlozheniye fosfororganicheskikh pestitsidov. [Pesticides and the environment. Degradation of organophosphorus pesticides.]** *Khim. Sel. Khoz. 12(4): 49-57; 1974.* (53 references) (Russian)

Studies on the metabolism and degradation of organophosphorus pesticides in soil, plants, and animals are reviewed. Most of the organophosphorus pesticides are decomposed by physical, chemical, and biological processes into simple components which are assimilated by microorganisms, animals, and plants. Oxidation and hydrolysis are the most common ways of metabolism of organophosphates, but reduction under anaerobic conditions may also occur. The rate of hydrolysis was dependent on the medium pH value and especially on the temperature. The final decay to simple inorganic compounds proceeds rapidly in biological media. Conjugate formation with plant cell substances and metabolism to water-soluble compounds eliminated in animal urine and feces were determined. The degradation of the highly persistent thiophos is facilitated by *Flavobacterium* species and exposure to light. Trichlorfon is degraded most readily in alkaline soils and leaves no harmful residue levels in plants and animals. Derivatives of 2-ethylchlorophosphonic acid are decomposed into inorganic phosphates and ethylene.

75-0167. Nishiuchi, Y. (Agr. Chem. Inspect. Sta., Min. Agr. Forest., Kodaira, Tokyo, Japan). **[Fish toxicity of agricultural chemicals and its evaluation.]** *Kongetsu No Noyaku (Agr. Chem. Mon.) 18(10): 84-87; 1974.* (Japanese)

First steps taken toward preventing injury to fish by pesticides have included ranking pesticides into

groups A, B and C according to their respective toxicities such as TLm and designating highly water polluting pesticides such as telodrin, endrin, endosulfan, PCP, and rotenone and controlling their use. Many problems remain to be studied, e.g., differences in susceptibility of fishes to pesticides and the recently reported phenomenon of spinal contortion in fish supposedly due to pesticides. An annexed table indicates newly registered pesticides (eight insecticides, seven fungicides, 13 herbicides, 10 plant growth regulators, 11 rodenticides, and 31 other chemicals), their toxicity TLm (48 hr) for young carp, and TLm (3 hr) for two kinds of water flea at 25°C. The TLm values for fishes ranged from 0.016 ppm (emulsifiable concentrate of acephate) to greater than 1000 ppm (3-methyl-2-butanone). The TLm for water flea ranged from 0.0056 ppm (emulsifiable concentrate of promecarb) to greater than 3800 ppm (emulsifiable concentrate of propyzamide).

75-0168. Hruban, Z.; Gotoh, M.; Slesers, A.; Chou, S. F. (Dept. Pathol., Univ. Chicago, Chicago, IL 60637). **Structure of hepatic microbodies in rats treated with acetylsalicylic acid, clofibrate, and dimethrin.** *Lab. Invest. 30(1): 64-75; 1974.* (34 references)

Dimethrin and chrysanthemumic acid were mixed with feed and given ad libitum to male Sprague-Dawley rats. Dimethrin was fed at the 2% level for 2, 4, and 6 weeks and chrysanthemumic acid at the 1% level for 6 weeks. Each compound led to accumulation of characteristic inclusions in the matrix of hepatic microbodies, which are thought to be regularly arranged enzyme molecules. The inclusions included matrical plates consisting of arrays of hollow plates which may be transformed into bitubular shapes. Microbodies of dimethrin-treated rats contained double- walled tubules composed of helically arranged grooved fibrils. Serum cholesterol levels in dimethrin fed rats were slightly to moderately increased, but there was no apparent correlation to the qualitative changes in the matrix of microbodies. Various tails and loops attached to forming and mature microbodies are interpreted as sections through gastruloid cisternae. Gastruloid cisternae may participate in the transformation of catalase precursors into catalase and in the packaging of catalase into microbodies.

75-0169. Lis, T.; Mierzejewski, J. (Inst. Vet. Sanit., Pulawy, Poland). **Wplyw foschloru i terationu na aktywnosc dopelniacza swinek morskich. [Effects of foschlor and teration on the activity of guinea pig complement.]** *Med. Dosw. Mikrobiol. 25(4): 345-350; 1973.* (14 references) (Polish)

Complement activity in guinea pig serum was tested at different time intervals 1) after in vitro exposure to a 5% solution of foschlor or 0.5% solution of teration, 2) in vivo after intramuscular injection of 1 ml of a 10% foschlor or 1% teration solution, and 3) after oral (intragastric) administration of 1 ml foschlor. Results were analyzed statistically. The complement activity gradually decreased from 205-219 units in controls to 151 units after in vitro exposure to foschlor and 155 units after teration. Following intramuscular injection of foschlor, the complement activity first increased to 256 units after 3 hours, then decreased to 179 units after 24 and 168 after 48 hours. Teration administered intramuscularly also first caused an increase to 271 units after 3 hours, then a decrease to 183 and 161 units after 24 and 48 hours respectively. After intragastric administration of foschlor, complement activity decreased to 178 units after 3 days and then remained at the 192 unit level for the next 11 days.

75-0170. Strik, J. J. T. W. A. (Author address not given). **Toxicity of hexachlorobenzene (HCB) and hexabromobiphenyl (HBB).** *Meded. Fac. Landbouwwetensch. Rijksuniv. Gent 38(3): 709-716; 1973.* (11 references)

The acute toxicity of the polyhalogenated aromatic compounds hexachlorobenzene and hexabromobiphenyl is very low. In contrast to the acute toxicity, the semichronic toxicity of these compounds is much greater, for these compounds have the ability to accumulate in the body due to their persistence and lipid solubility. Effects of polyhalogenated aromatic compounds in Japanese quail are weight loss, tremor, liver injury, and mortality. The most impressive response is porphyria, the accumulation of porphyrins in the liver, kidneys, intestine, and other organs. This also occurs in chickens, but not in all bird species. These species differences may be correlated with the natural diet; diets with high protein content appear protective. The activity of aminolevulinic acid synthetase, the key enzyme of the haem biosynthetic pathway, was increased after exposure. No difference was noted in he activity of aminolevulinic acid dehydratase, the second enzyme in the haem biosynthetic pathway. The activity of glutamate dehydrogenase in serum was taken as a parameter for liver injury, especially mitochondrial damage. It was concluded that liver and kidney damage, especially of mitochondria, is involved in the slow developing of the porphyria caused by the polyhalogenated aromatic compounds.

75-0171. Brzheskiy, V. V. (All-Union Sci. Res. Inst. Disinfection and Sterilization, USSR Ministry of Public Health, Moscow, USSR). **K voprosu o vozmozhnosti indutsirovaniya mutatsiy u *Drosophila melanogaster* pri deystvii khlorofosa. [Possibility of inducing mutations in *Drosophila melanogaster* through the action of chlorophos.]** *Med. Parazitol. Parazit. Bolez. 42: 703-706; 1973.* (12 references) (Russian)

The possibility of inducing mutations in male specimens of *Drosophila melanogaster* lines D-32 and Meller-5 through the action of trichlorfon was studied. The test specimens were exposed to 0.075 ml 15% tri-

chlorfon applied on filter paper in a 1,500 cm^3 space for 3.5 hr. No significant change was established in fertility in the first generation, or in the mutation frequency, during the different stages of spermatogenesis, compared with a control group. However, there was a tendency toward increased frequency of partial mutations in the spermatogonia. No definite correlation was established between the intensity of the embryotropic action in birds and mammals and the mutagenic effect in *D. melanogaster.*

75-0172. Sciesinski, K. (Inst. Animal Physiol., Vet. Dept. of SGGW, Warsaw, Poland). **Wartosc diagnostyczna oznaczenia aktywosci esterazy cholinowej w przebiegu zatruc kur preparatami fosfoorganicznymi. [Diagnostic value of cholinesterase activity determinations during intoxication of chickens by organophosphorus compounds.]** *Med. Wet. 28(4): 225-228; 1972.* (13 references) (Polish)

A single subtoxic (60 mg/kg) dose of liquid Sadofos 30 (malathion) was administered by stomach tube to 18 adult hens,and their serum cholinesterase activity was determined by the colorimetric method according to Hestrin and by the "Biophan C" dry test. Determinations were made every few hours during the first day after administration and then every few days up to 28 days. From a control level of 65 μM/ml/hr the cholinesterase activity decreased to 50 μM/ml/hr after 2 hours, reached a minimum of 10 μM/ml/hr after 8 hours, and then gradually increased to normal values on the 22nd day. Similar results were obtained with the "Biophan C" test. No clinical symptoms of intoxication were observed in spite of the markedly reduced cholinesterase activity.

75-0173. Ramisz, A. (Dept. Vet. Hyg., Krakow, Poland). **Zastosowanie metod histochemicznych do wykrywania zatruc zwiazkami fosfoorganicznymi. [Use of histochemical methods for the detection of poisoning with phosphoorganic compounds.]** *Med. Wet. 29(12): 723-726; 1974.* (18 references) (Polish)

Using the histochemical method of Koelle-Friedenwald (Gomori modification and Bueding adaptation) the activities of acetylcholinesterase (AChE) and pseudocholinesterase (PChE) were determined in motor end plates of striated diaphragm muscles in 72 white mice (av. wt. 20 g). Results obtained in animals poisoned by oral administration of "Neguvon" (20 mg/mouse by gastric tube) were compared at different time intervals to those in animals killed by severing the spinal cord. AChE activity in poisoned animals was inhibited by 70% after 24 hours and 80% after 48 hours (in relation to activity immediately after death) and was only slightly reduced in controls (10% and 20% respectively). The PChE activity in poisoned animals was more strongly affected than AChE activity; it was reduced 90% after 24 hr and almost 100% after 48 hr, while in controls the reduction of activity was similar to that of AChE (15-20%).

75-0174. Lis, T.; Mierzejewski, J. (24-100 Pulawy, Ul. Krancowa 19/17, Poland). **Wplyw foschloru na aktywnosc lyzozymu surowicy krwi swinek morskich. [The effect of foschlor on lysozyme activity in sera of guinea pigs.]** *Med. Wet. 30(2): 105-107; 1974.* (10 references) (Polish)

The effect of Foschlor on lysozyme activity in guinea pig serum was determined in 40 samples after in vitro addition of 0.05 ml of 2% foschlor solution per 0.35 ml of serum. Lysozyme activity was also examined before and after intramuscular injection of 1 ml of 2% foschlor into 13 guinea pigs (in vivo effect). The Harrison modification of the Smolelis and Hartsell turbidimetric method using a 24 hour culture of *M. lysodeicticus* was employed. Results were analyzed statistically. In vitro, a statistically significant decrease (17-55 units) in lysozyme activity was detected in comparison to control samples. In vivo, lysozyme activity decreased from an average of 270 units before injection of foschlor to 216 units at 3 hours, 230 units at 24 hours, 186 units at 48 hours, and 251 units at 144 hours after intramuscular injection of the compound. This decrease was statistically significant. It is postulated that the decrease in lysozyme activity is due to a direct action of foschlor on the enzyme as well as a destructive action on lysozyme-synthetizing RES cells.

75-0175. Khikhmatullayeva, Sh. S.; Ibragimova, G. Z. (Dept. Communal Hyg., Tashkent Med. Inst., Tashkent, USSR). **Vliyaniye treflana na obshchesanitarnyy rezhim vodoyemov. [Effect of treflan on the general sanitary condition of reservoirs.]** *Med. Zh. Uzbek. 12: 22-23; 1973.* (Russian)

A general hygienic assessment of trifluralin residues in reservoirs is presented. Trifluralin, a herbicide of low toxicity, kills *Daphnia* in water in 1 to 2 min when present in a concentration of 0.002%. The odor and color threshold of trifluralin in water was 2 mg/liter. In concentrations of 2 mg/liter and over, trifluralin inhibits biochemical oxygen consumption, nitrification, ammonification processes, and bacterial growth. The threshold concentration of the effect of trifluralin on the sanitary conditions in reservoirs was 4 mg/liter.

75-0176. Zhabyuk, F. V. (Author address not given). **Vpliv prometrinu, trikhloratsetatu natriyu ta ikh sumishi na mikrofloru gruntu i urozhay kartopli. [The effect of prometryne, sodium trichloroacetate and their combination on soil microflora and potato yield.]** *Mikrobiol. Zh. (Kiev) 35(3): 394; 1973.*(Ukrainian)

The effect of prometryne, sodium trichloroacetate, and their combination on the soil microflora and the potato yield was studied. Prometryne stimulated

actinomycetes and ammonifying bacteria during the entire vegetation period, as well as microscopic fungi after application. However, it suppressed the development of denitrifying and oligonitrophilic bacteria for some time immediately after application. Sodium trichloroacetate, applied at a rate of 8 kg/ha, stimulated the growth of actinomycetes during the entire vegetation period and that of most fungi during the initial stages of the vegetation period. The combination of the two herbicides stimulated the growth of the denitrifying bacteria and inhibited the oligonitrophilic bacteria during the initial phase of the vegetation period.

75-0177. Kada, T.; Moriya, M.; Shirasu, Y. (Dept. Induced Mutat., Nat. Inst. Genetics, Mishima, Shizuokaken 411, Tokyo, Japan). **Screening of pesticides for DNA interactions by "rec-assay" and mutagenesis testing, and frameshift mutagens detected.** *Mutat. Res. 26(4): 243-248; 1974.* (18 references)

The "rec-assay" is a previously proposed method for screening chemical mutagens by using recombination-deficient (*rec*) strains of *Bacillus subtilis*. Using this procedure, several new pesticides have been identified as mutagens. Captafol (Difoltan) and Captan were base change mutagens. DAPA (Dexon) and NBT (Nirit) were frameshift mutagens. Eight positive compounds not yet specified as to type of mutagenicity are: thiram, ziram, bis-dithane[dizinc bis-(dimethyldithiocarbamate) ethylene bis(dithiocarbamate)], dichlofluanide, DTAS [poly(methyl-bis(thiocyanato)arsine)], Asozine (CH_3AsS), Stryocide [Beta-methyl-beta-nitro-parathiocyanatostylene], and [*N,N'*-ethylene bis(thiocarbamoyl)sulfide].

75-0178. Sobels, F. H. (Dept. Radiat. Genet. Chem. Mutagenesis, Univ. Leiden, Leiden, The Netherlands). **The advantages of *Drosophila* for mutation studies.** *Mutat. Res. 26(4): 277-284; 1974.* (40 references)

Unlike most other test systems, *Drosophila*, due to the wealth of specific tester strains, special markers, useful inversions, or other rearrangements, permits assessment of the total spectrum of genetic effects, including gene or point mutations, small deficiencies that will be effectively transmitted as amorphs, chromosome breakage effects, non-disjunction and genetic recombination. Using mice and rats, it is impossible to conclude that chromosome breakage *per se* will constitute a serious genetic risk, since some substances (e.g. caffeine) produce chromosomal breaks without rearrangement. While death of a zygote in early stages (criterion for dominant lethality) does not impose a serious genetic risk, rearrangements between broken chromosomes may produce malformed offspring. In *Drosophila*, it may be seen that caffeine reduces incidence of translocations by inhibiting repair of radiation induced chromosomal breaks. On the other hand, the fact that some compounds (e.g., hycanthone, diethylnitrosamine, and diethyl sulfate) may register mistakenly as safe in mammalian systems, they produce recessive sexs-linked lethals at high frequency in *Drosophila*, but no chromosome breaks. In addition, *Drosophila* offers the quickest mutagenicity test system available.

75-0179. Seidel, K. (Limnologische Arbeitsgruppe, Max-Planck-Institut fuer Zuechtungsforschung, Krefeld-Huelserberg, Germany). **Eliminierung von Pentachlorophenol durch Pflanzen aus Gewaessern. [Elimination of pentachlorophenol from water bodies by plants.]** *Naturwissenschaften 61(2): 81; 1974.* (1 reference) (German)

The elimination of pentachlorophenol from water by *Juncus effusus* L., *J. maritimus* Lamk., *Bolboschoenus maritimus* (L.) Palla, *Schoenoplectus lacustris* (L.) Palla, and *Sch. tabernaemontani* (C. C. Gmel.) Palla was studied. The pentachlorophenol concentration in the water was 3 mg/liter. *J. effusus* was more suitable for the elimination of pentachlorophenol than was *J. maritimus*. *Sch. lacustris, Sch. tabernaemontani* and *B. maritimus* were inefficient regarding the elimination of pentachlorophenol. No plant damages were observed due to pentachlorophenol. In water containing 4 mg pentachlorophenol and 20 g sodium chloride per liter, the plants remained intact, and eliminated pentachlorophenol practically quantitatively at a load of 640 mg per m^2 of plant surface per day.

75-0180. Bock, K. W. (Inst. Toxikol., Univ. Tuebingen, Germany). **Oxidation of barbiturates and the glucuronidation of 1-naphthol in perfused rat liver and in microsomes.** *Naunyn-Schmiedeberg's Arch. Pharmacol. 283(3):: 319-330; 1974.* (33 references)

An attempt has been made to relate quantitatively drug metabolism in perfused liver with that in microsomes. Therefore in both systems microsomal monooxygenase (hexobarbital as substrate) and UDP-glucuronyltransferase (1-naphthol as substrate) have been studied. The rate of hexobarbital oxidation in perfused liver was slightly higher than in microsomes incubated with an NADPH regenerating system, indicating that the generation of reducing equivalents is not rate-limiting in livers of normal rat. The rate of phenobarbital oxidation was only about 3% of the rate of hexobarbital oxidation in perfused liver. Microsomal UDP-glucuronyltransferase can be activated about 10-fold in vitro. The formation of naphthol glucuronide in perfused liver (determined from the appearance of glucuronide in liver tissue, perfusate and bile) corresponded well with UDP-glucuronyltransferase activity in non-activated microsomes when the intracellular UDP-glucuronate level was taken into account. This suggests that UDP-glucuronyltransferase is mostly latent within the cell. (Author abstract abstract by permission)

75-0181. Fenichel, G. M.; Dettbarn, W. D.; Newman, T. M. (Vanderbilt Univ. Sch. Med., Nashville, TN). **An experimental myopathy secondary to excessive acetylcholine release.** *Neurology 24: 41-45; 1974.* (10 references)

Six intact white, female, Sprague-Dawley rats received daily injections of guanidine hydrochloride (250 mg/kg) and paraoxon (0.25 mg/kg). Animals were examined on day 3 and day 4. Six other intact animals were given daily injections of carbamylcholine (0.50 mg/kg) and paraoxon (0.25 mg/kg). Animals were examined on day 3 and day 5. The combination of guanidine and paraoxon exaggerated and prolonged the symptoms of trembling, ruffling of fur, respiratory stridor, and red tearing which were experienced with guanidine alone. This concentration of paraoxon has no effect by itself. But in combination with guanidine it increased the frequency of lesions so that all animals had at least one abnormal muscle. Lesions induced by this combination were noted not only in the soleus muscles, but in some quadriceps and gastrocnemius muscles also. The distribution of abnormal fibers was similar to the cluster pattern of guanidine alone and differed from the more diffuse pattern previously described in paraoxon myopathy. Carbamylcholine alone and in combination with paraoxon produced no architectural changes in any of the muscles studied. Results suggest that myopathies provoked by excessive ACh are not a function of end-plate depolarization but are more likely related to the role of ACh in the trophic effect of nerve on muscle.

75-0182. Gaon, J. A. (Inst. Epidemiol., Sarajevo Univ., Sarajevo, Yugoslavia). **Louse eradication programs in Yugoslavia.** *Pan Amer. Health Organ. Sci. Publ. 263: 32-40; 1973.* (27 references)

The use of insecticides to eradicate pediculosis in preference to just an eductional program is necessary: when old endemic foci of typhus exist and outbreaks are possible; when there are recrudescent forms of typhus (Brill-Zinsser disease) and primary cases of typhus; when there is a dynamic process of migration to and from lousy environments; or when there is possible increase during natural or man-induced disasters. DDT emulsion, lindane, or other insecticides nontoxic to humans are used. The same insecticide must be used in all areas undergoing spraying. Spraying of underwear, clothing, and fabrics with 2% DDT emulsion is carried out only in homes where lice are present. A 0.5% emulsion is used for hair. Treatment is done twice a year: at the time of yearly increase and when infestations are at the peak. DDT emulsion is simultaneously sprayed on workers in large companies or plants, forest workers, and others. This part of the program lasts three years. The following two years include an active field search for febrile patients suspected of having typhus or Brill-Zinsser disease. After this time the area may be declared eradicated of pediculosis and typhus. Studies have indicated that continuous hygiene and education measures coupled with occasional exceptional use of DDT yields more lasting results.

75-0183. Gear, J. H. S. (South African Inst. Med. Res., Johannesburg, South Africa). **Rickettsial diseases of southern Africa, with special reference to their control.** *Pan. Amer. Health Organ. Sci. Publ. 263: 41-42; 1973.*

Four rickettsial diseases infect man in southern Africa. They are: epidemic louse-born typhus, caused by *Rickettsia prowazeki* and transmitted by the human louse, *Pediculus humanus*; murine flea-borne typhus, caused by *R. mooseri* and transmitted by rat fleas, particularly *Xenopsylla cheopis*; tick-bite fever caused by *R. conori* var. *pyyeri* and transmitted to man usually by bite; and Q fever, caused by *R.* or *Coxiella burneti*, transmitted to man primarily by inhalation of infected dust. The manufacture of DDT began in South Africa to meet the typhus threat during World War II. The population readily used DDT to control not only lice, but many other arthropod pests. Since its widespread use, louse-borne typhus has ceased to be a major epidemic disease in this area. In the year immediately following its introduction, the usual case load of several thousand dropped to only a few hundred. However, the infection continues to smolder and in 1972 two outbreaks occurred, one in Lesotho and another near Queenstown, where the first instance of louse resistance to DDT was reported. Both outbreaks were controlled by widespread use of DDT and other insecticides and selective vaccination. A slight diminution in the incidence of both Q fever and tick-bite fever has been noted, possibly due to use of highly potent insecticides for dipping cattle to rid them of ticks. The incidence of murine flea-borne typhus has fallen markedly, perhaps due to the effect on fleas of the insecticides used to control flies and other pests.

75-0184. Makara, G. (State Inst. Hygiene, Budapest, Hungary). **Typhus and louse control in Hungary.** *Pan Amer. Health Organ. Sci. Publ. 263: 43-46; 1973.*

Control of lice and louse-borne diseases in Hungary has been dictated largely by prevailing conditions and desired results. In emergency situations where acute typhus danger is at hand, or when louse-infested persons enter uninfested closed communities such as hospitals, delousing of the entire body surface and disinfection must be taken together. Insecticide powders which are effective only against motile louse stages are at best only an auxiliary measure. When more time can be taken to achieve eradication, the easily applicable residual insecticides which do not have side effects should be applied to environmental surfaces, and the impregnation of clothing with insecticides should be used to control body lice. Inadequacies sometines occur in the application of insecticides. Such inadequacies include: poor choice of insect-killing substances when insecticides that destroy only motile stages or to which lice are known to

be resistant are picked; the use of powdered insecticides which are known to be unpopular with the patients: and insufficient or improper application techniques.

75-0185. Grothaus, R. H.; Cole, M. M. (Naval Med. Field Res. Lab., Camp Lejeune, NC). **Screening and testing techniques for new louse powders.** *Pan Amer. Health Organ. Sci. Publ. 263: 141-143; 1973.* (13 references)

In screening new louse powders the first step is to test the new chemical for insecticidal activity. The beaker test is used for initial screening. Compounds which cause 100% mortality of the test lice for 10 days or more are formulated in pyrophyllite and studied further by the powder panel test. Compounds exhibiting 90% effectiveness for 14 days are tested at lower concentrations until the minimum effective dosage for 14 days is established. Cross resistance is then tested with the DDT-resistant and susceptible strains of lice. Promising compounds are sent through toxicology testing. Experiments include tests on small animals for acute skin and eye irritations, subacute toxicity involving eye irritation, skin absorption, feeding, and sensitization. When approved as safe for limited tests on human subjects such tests begin. These tests offer data on the effective life of the compound under simulated field conditions. Acutal field tests are then conducted.

75-0186. Eldridge, B. F. (Dept. Entomol., Walter Reed Army Inst. Res., Washington, DC). **Repellents and impregnants for the control of body lice.** *Pan Amer. Health Organ. Sci. Publ. 263: 177-178; 1973.*

Advantages in using repellents and impregnants over the use of toxicant powders, fumigants, or steam sterilization for louse control include the fact that impregnants can be incorporated into clothing or bedding by the manufacturer or at large-volume laundries. Materials so impregnated may remain effective through several washings. The wearer of such clothing may not even notice the presence of an antilouse agent, and this method should be cheaper than other forms of control. Lindane (a 0.3% solution) is effective in this respect, but does not remain so after a second washing. Three insect replellents are stocked in the U.S. military supply system for use on clothing. M-1960 (30% 2-butyl-2-ethyl-1,3-propanediol, 30% benzyl benzoate, 30% *n*-butylacetanilide and 10% Tween 80) is a general purpose repellent. A combination of 75% *N,N*-diethyl-*m*-toluamide (deet) and 25% ethanol is used against arthropods that spend significant amounts of time off the human host. The third, 90% benzyl benzoate, is particularly effective against chiggers. The use of body belts impregnated with a thiocyanate compound for body louse control has thus far seemed fairly effective.

75-0187. Weidhaas, D. E. (Insects Affecting Man and Animals Res. Lab., ARS, USDA, Gainesville, FL). **Repellents and impregnants: M-1960 and deet.** *Pan Amer. Health Organ. Sci. Publ. 263: 178-179; 1973.*

The effectiveness of M-1960 against body lice was tested using subjects wearing impregnated uniforms. A total of 60 subjects was divided into 2 groups of 30 men each. In each group 15 men wore louse-free clothing treated with M-1960 and 15 others were louse-infested persons wearing untreated clothing. Each group of 30 was housed in a single tent. After 24 hr, 5 of the 30 people wearing treated uniforms were infested with one louse each. After 17 days the number of persons who becamse infested while wearing treated uniforms ranged from 3 to 25. The same individuals were not continuously infested. It was shown that the treated uniforms killed lice slowly and did not prevent infestation and biting when the wearer was in contact with louse-infested persons. Similar studies with deet (*N,N*-diethyl toluamide) have not been conducted. Deet has been shown toxic to lice in laboratory studies, but its repellent properties have yet to be examined.

75-0188. Cole, M. M.; Clark, P. H.; Grothaus, R. H. (Insects Affecting Man and Animals Res. Lab., ARS, USDA, Gainesville, FL). **Some candidate louse powders.** *Pan Amer. Health Organ. Sci. Publ. 263: 179-180; 1973.* (12 references)

Abate, 2%, provided about 95% control for 25 days against natural infestations of DDT-resistant lice. No ill effects on human subjects were noted after one treatment of about 57 g/subject. No resistance has as yet been reported. Cidial (phorate) 1%, has been cleared for sleeve tests on human subjects. Resistance to technical material has been shown in the laboratory with malathion-resistant lice. Mobam, 5%, was almost 100% effective for 28 days against natural infestations by DDT-resistant lice. No ill effects were detected in humans receiving one treatment of 34 g/subject. Resistance is theoretically possible; cross-resistance has been shown by malathion-resistant lice. Carbaryl, 5%, showed no ill effects in humans receiving two treatments 14 days apart at 42 g/subject. Resistance to technical material has developed in the laboratory. GS-12968, 2%, was cleared toxicologically for experimental use in sleeve tests. All these compounds, with the exception of carbaryl, were more effective than 1% malathion in sleeve tests against DDT-resistant lice. Abate, cidial, and carbaryl are available commercially. Industrial development of mobam and geigy has been dropped.

75-0189. Gratz, N. G. (Vector Biol. and Control, WHO, Geneva, Switzerland). **Louse powders: problems in field programs.** *Pan Amer. Health Organ. Sci. Publ. 263: 180-181; 1973.*

In order to choose the correct insecticide for use in an emergency control program, one must consider the results of insecticide susceptibility tests. However, even with these results, the financing of the purchase of the

chemical is often a difficult matter. It is equally difficult to convince manufacturers to produce such chemicals, for these compounds have no agricultural value and thus are not as profitable as other areas of production. The tasks of forecasting epidemics and their locations, obtaining funds, and understanding the administrative practices and effectiveness of governments of countries in which epidemics may occur will determine in part whether a given compound should be purchased in large quantities and stockpiled, where it should be stored, and whether it should be purchased in concentrated form. Many countries lack adequately trained personnel to carry out appropriate procedures under epidemic conditions once the decision to use a mass insecticide dusting campaign is made. Thus, the organization of such a campaign is very often difficult and slow.

75-0190. Steinberg, M. (U. S. Army Environmental Hygiene Agency, Edgewood Arsenal, MD). **Field studies of topically applied louse toxicants.** *Pan Amer. Health Organ. Sci. Publ. 263: 181-186; 1973.* (7 references)

Mobam was prepared in 2 and 5% formulations in pyrax powder and subjected to field tests to evaluate its potential use as a field lousicide. Volunteers were divided into 3 groups; the first group was dusted with 17 g untreated pyrax powder, the second with an average of 34 g of 5% Mobam in pyrax powder/man, and the third with an average of 20 g of 1% malathion in inert powder/man. No test participant evidenced any symptoms attributable to the treatment. No physiologically significant depression of cholinesterase activity was noted. Liver function tests were normal. No skin irritation was observed. A second test was designed to compare treatment methods using material dispensed from shaker-top cans compared against material dispensed from U.S. Army power delousers. No toxicological effects were noted during these experiments using either Mobam or Abate. Results of these studies indicated there were no medical contraindications to the single application of 56.7 g of 2% Abate, 20 g of 1% malathion, or 34 g of 5% Mobam formulation for 25 days.

75-0191. Grothaus, R. H.; Cole, M. M. (Entomol. Div., Naval Med. Field Res. Lab., Camp Lejeune, NC). **Use of fumigants for control of body lice.** *Pan Amer. Health Organ. Sci. Publ. 263: 192-195; 1973.* (15 references)

Criteria used to screen fumigants for control of body lice include human toxicity, cost, odor, volatility, flash point, boiling point, effect on clothing, time required for destruction of lice and eggs, and availability. Hydrogen cyanide, though effective, is dangerous due to its high mammalian toxicity. Methyl bromide is very effective and is available in 20 cc ampules for individual usage. Ethyl formate has not been extensively used for louse control, but studies indicate that it would be effective for individual clothing treatment. Aluminum phosphide provides control, but is difficult to use and highly toxic. Dichlorvos resin strips have been tested and found ineffective unless being used under conditions where very little clothing is involved. When a dichlorvos resin strip was placed on top of 12 kg of uniforms infested with 20 to 30 1-to-5 day old eggs and put in a sealed seabag, the results indicated the strip was completely without value.

75-0192. Gerberg, E. J. (Insect Control and Res., Inc., Baltimore, MD). **Head lice: control and nit removal.** *Pan Amer. Health Organ. Sci. Publ. 263: 196-198; 1973.* (17 references)

Lindane, DDT, malathion, pyrethrum, lethane, and thanite have all been used to control or eliminate human head lice. Presently lindane, malathion, and pyrethrum are the pesticides of choice. The removal of the nits or eggs is often very difficult. The egg is fastened to the hair shaft with a binder which is excreted by the insect and which hardens into a bonding agent. The fibers or filaments of the bonding agent are a natural adhesive peculiar to the louse. It is postulated that this adhesive is either a protein compound similar to hemoglobin or a complex polysaccharide. The action of a number of enzymes against this bonding agent have been investigated. The enzyme showing the greatest activity was the one highly effective against hemoglobin. This enzyme is a derivative of *Apergillus oryzae* It is suggested that the bond between the egg and the hair has been hydrolyzed and thus weakened, if not dissolved, allowing the egg to be readily removed.

75-0193. Makara, G. (State Inst. Hygiene, Budapest, Hungary). **Chlorphenamidine as an ovicide and the efficiency of heat in killing lice and nits.** *Pan Amer. Health Organ. Sci. Publ. 263: 198-200; 1973.*

The efficacy of chlorphenamidine, an acaricide with an oral LD50 rate of 250, was tested against nits. A 0.1% solution killed nits within 10 min. The same effect was noted on nits in immersed cloth, although little effect was noted on motile louse stages. After a 30 min exposure to a 0.5% solution, only about half the lice were killed. Chlorphenamidine can be easily used in combination with lindane, malathion, or other insecticides and incorporated into shampoo, emulsion concentrates, and hair spirits or ointments. It remains stable for one year. Using the shampoo preparation and following a normal washing procedure for about 15 min removed head lice from 97% of 150 persons so treated. In a similar group treated with the conventional combination of lindane and pyrethrum, only a 67% removal was achieved. Irritancy and toxicity of chlorphenamidine are minimal.

75-0194. Woodward, T. E. (Univ. Maryland, Sch. Med., Baltimore, MD). **Successful control of typhus in Naples, 1943-44.** *Pan Amer. Health Org. Sci. Publ. 263: 200-201; 1973.*

In September of 1943 it was acknowledged that typhus was present in Naples. It is not certain whether the disease arrived from North Africa, from Yugoslavia across the Adriatic, or from the Northern Front. On October 1 the disease was definitely present in epidemic form, due to the overcrowded conditions of the city and the lack of soap and warm water for normal sanitary use. MYL powder containing pyrethrum and DDT had been effective in killing lice when applied manually to the clothing of natives in populations near Algiers. These techniques were brought to southern Italy. Clearly it was the application of lousicides to the patient, to his contacts, and in the immediate vicinity of the case which stopped the epidemic. Neither mass delousing nor vaccine had any significant influence. Under field conditions it is difficult to distinguish between a convalescent typhoid fever patient and a typhus patient. The bedside slide agglutination Weil-Felix test, which is rapidly positive in convalescents, was used to determine whether time, equipment, and personnel would be spent in delousing the patient's contacts and the surrounding area.

75-0195. Smith, C. N. (Insects Affecting Man and Animals Res. Lab., ARS, USDA, Gainesville, FL). **Special problems concerning toxicity of repellents and insecticides.** *Pan Amer. Health Organ. Sci. Publ. 263: 201-202; 1973.* (5 references)

Of the large numbers of new compounds developed for possible use as repellents and insecticides, a large portion are eliminated as being extremely hazardous even during the synthesis research stage of production. Of those which are formulated into louse powders or repellents, relatively quick and cheap toxicologic tests are performed immediately which do not require exposure to human skin. Therefore, only a relatively few compounds, those which appear to be most effective, are subjected to toxicologic testing to determine their safety for skin application. Compounds clearing this part of the testing procedure may still undergo several years of tests under a variety of field and laboratory conditions before a few of the most effective are chosen for large-scale testing. Use of more than one compound in the same formulation presents special toxicologic problems of possible synergistic and additive effects. It cannot be assumed that toxicologic clearance to use 2 or more toxicants individually implies clearance to use them in combination. Recommendation for general unsupervised use of a compound may depend in part on the formulation that will be distributed. Individual sensitivity of some persons to certain compounds and induced sensitization caused by repeated exposure to the same compound are important toxicological problems. The question is not to decide whether the compound is toxic, but rather, how much toxicity can be reasonably considered acceptable.

75-0196. Busvine, J. R. (Dept. Entomol., London Sch. Hyg. Trop. Med., London, England).**Certain aspects of insecticide resistance.** *Pan Amer. Health Organ. Sci. Publ. 263: 212-216; 1973.* (21 references)

Specific tests, such as the WHO test for resistance in body lice to DDT or malathion or the beaker test, give early and reliable warning of resistance in insects and determine the cross-resistance pattern for use in selecting other insecticides. Even though resistance to a given pesticide may not develop under laboratory conditions, it can still occur in the field. The field incidence seems related to extensive use of the insecticide. Massive delousing campaigns must not be undertaken merely as a general sanitary measure, lest valuable weapons against future epidemics be lost. Widespread use of pesticides for agricultural or other purposes may also contribute to resistance in lice. The term cross-resistance describes resistance extending to several compounds from which a single mechanism protects the insect. Double, treble, or multiple resistance describes cases where two or more defense mechanisms, protecting against different types of toxicants, have accumulated in the same strain. Multiplicate resistance is suggested as an additional term describing the coexistence of distinct mechanisms protecting against a single toxicant, e.g., toxicant metabolism plus resistance to penetration.

75-0197. Perry, A. S. (Center Disease Control, U.S. Public Health Service, Savannah, GA). **Biochemistry of DDT resistance in the human body louse *Pediculus humanus humanus.*** *Pan Amer. Health Organ. Sci. Publ. 263: 226-229; 1973.* (26 references)

Resistance to DDT in insects is largely due to the insects' ability to detoxify the compound by dehydrochlorination, hydroxylation, or some other mechanism. Dehydrochlorination is used by the housefly and other insects. In the hydroxylation pathway, DDT is converted to 4,4-dichloro-α-(trichloromethyl)-benzhydrol (dicofol). The mixed-function oxidase system responsible for this biotransformation requires NADPH and molecular oxygen for activation. Studies of DDT resistance in the Korean strain of lice showed DDT was absorbed very slowly from acetone or benzene solutions when applied topically to either susceptible or resistant lice. However, the resistant strain could tolerate larger quantities. The resistant strain tolerated 100 ppm of DDT in the blood whereas 10-25 ppm caused 53 to 90% mortality in the susceptible strain. Enzymatic degradation of DDT by susceptible and resistant lice revealed three metabolites: DDE; DDA, bis-(*p*-chlorophenyl)-acetic acid; and DBP, 4,4-dichlorobenzophenone . Several enzyme types were shown to be involved in the degradation of DDT by the human louse. It is noted that the metabolite DDA, which is the predominant product of DDT metabolism in man, is a major DDT metabolite in the louse but not in other insects.

75-0198. Peardon, D. L. (Vet. Products Projects, Rohm and Haas Co., Spring House, PA). **RH-787, a new selective rodenticide.** *Pest Contr. 42(9): 14,16,18,27; 1974.* (8 references)

RH-787, 1-(3-pyridylmethyl)-3-(4-nitrophenyl)-urea, is a selective, single-dose rodenticide which will provide an alternative to anticoagulants in the fight against rats. This new rodenticide is effective against rats which have become genetically resistant to anticoagulants like warfarin. The rodenticide does not appear to be a hazard to non-target animals since a wide margin of safety has been demonstrated between LD50 levels in all animals tested except cats. The LD50 was 4.75 mg/kg for Norway rats, 710 mg/kg in chickens, 1780 mg/kg in pigeons, > 500 mg/kg in dogs, and 2000-4000 mg/kg in rhesus monkeys. The last finding may indicate that RH-787 would not be toxic to humans under use conditions, but no specific data is available yet. The rodenticide is slow acting, requiring several hours to kill a rat or a mouse after a lethal dose has been ingested, and has a long shelf life. Experiments with rabbits indicate that the formulations of RH-787 should not be hazardous to man when handled according to recommendations. No adverse effects were noted on dogs or cats which were fed the carcasses of rats killed with RH-787. RH-787 is well accepted in bait formulations, not arousing any suspicion on the part of the rats feeding on the poisoned bait.

75-0199. Jaskowski, L.; Juszkiewicz, T.; Kosmala, K.; Szulc, L. (Inst. Vet., Pulawy, Poland). **Nastepstwa zewnetrznego zastosowania zwiazkow fosfoorganicznych u buhajow na jakosc ich nasienia. [Effect of external application of organophosphorus compounds on semen quality of bulls.]** *Pol. Arch. Wet. 16(4): 611-620; 1973.* (10 references) (Polish)

Fenchlorfos was applied to groups of 12-20 month-old bulls. Group I received 200 mg/kg in a single application on the skin (whole body including the scrotum), group II received 100 mg/kg on the skin of the back only, group III a total of 100 mg/kg applied on the scrotum in 20 repeated applications over a 2 day period, and group IV served as control. Ejaculate volume, motility of spermatozoa, morphology and percentage of dead cells were examined before and 2, 4, 8, 13, and 63 days, after application of the compound. In addition, fenchlorfos was determined in peripheral blood, semen, testicular tissue, seminal vesicles, and cauda epididymidis, and semen cholinesterase activity was measured 6 and 7 weeks after application. Results indicated that fenchlorfos caused a slight diminution of ejaculate volume and a statistically significant decrease in motility of spermatozoa in all experimental groups, and a decrease in percentage of live spermatozoa and increase in morphologically abnormal cells in group III. These changes persisted in group III for a long time (up to 6 months). Fenchlorfos disappeared quickly from semen and serum and was absent in all groups after 4 days. The concentration of the compound in seminal vesicles, cauda epididymidis and testicular tissue was much higher in group III (0.506, 2.194 and 0.936 ppm respectively) than in group II (0.179, 0.031, and 0.235 ppm respectively). Cholinesterase activity was markedly inhibited in all experimental groups, especially in group III.

75-0200. Waldron, A. C.; Naber, E. C. (Ohio State Univ. and Ohio Agr. Res. and Develop. Cent., Columbus, OH 43210). **Importance of feed as an unavoidable source of pesticide contamination in poultry meat and eggs.** *Poultry Sci. 53(4): 1428-1435; 1974.* (10 references)

DDT and metabolites, dieldrin, heptachlor epoxide, and lindane pesticide residues accumulated in the body tissues and the eggs of laying hens in direct proportion to the concentration of the pesticide or its parent compound in feeds. Methoxychlor residues did not accumulate at any of the concentration levels used in the study. Plateaus of residue accumulation occurred independently for each pesticide concentration after 6 to 12 weeks of feeding at which time, as long as the concentration in the feed remained constant, the apparent elimination or metabolism of the pesticide residue balanced the intake. The concentration of residues in eggs at the plateau was directly proportional to and dependent on the concentration in the feed. The same direct relationship existed between the concentration of pesticide residue in the feed and the residue in the body tissues. The significance of pesticide contamination in eggs resulting from feeding levels of 0.1 ppm and less is highly questionable because concentrations in eggs were generally below 10 ppb and very seldom exceeded 50 ppb. Although higher concentrations of pesticide residues were found in the body fat at the 0.1 ppm level, the transfer of residue to the egg did not appear to be important. (Author abstract by permission)

75-0201. Putnam, E. M.; Brewer, R. N.; Cottier, G. J. (Dept. of Poultry Sci., Alabama Agr. Exp. Sta., Auburn Univ., Auburn, AL 36830). **Low level pesticide contamination of soil and feed and its effect on broiler tissue residue.** *Poultry Sci. 53(5): 1695-1698; 1974.* (4 references)

Continuous exposure to low levels of five organochlorine pesticides in feed, soil of floor pens, or a combination of the two, led to measurable residues in the abdominal fat of broilers by 8 weeks of age. Dieldrin, aldrin, heptachlor, mirex, and DDT from commercial formulations were administered to a total of 2,800 broiler chickens during four consecutive trials. The low level soil treatment averaged 0.048 ppm of pesticide and the high level 0.289 ppm. Feed levels ranged from 0.006 ppm in the low level feed to 0.0389 ppm in the high level. Tissue residues above the Alabama caution level were recorded for dieldrin (4.65 ppm); heptachlor,

(0.643 ppm); and mirex, (0.95 ppm) following eight weeks on high level feed. DDT (2.11 ppm); did not exceed the caution level of 5.6 ppm. Soil contamination had much less effect on tissue residues than when the pesticides were in the feed. Dust collected from the walls of the pens was found to contain low levels of all four materials and was considered to be the source of contamination in control pens. (Author abstract by permission)

75-0202. Polin, D.; Ringer, R. K. (Poultry Sci. Dept., Michigan State Univ., East Lansing, MI 48824). **Toxicity and withdrawal rates of DDT from chickens treated with diphenylhydantoin.** *Poultry Sci. 53(5): 1966-1967; 1974.*

Two experiments were conducted using sex-separated broiler-type chickens to determine the toxic effects of feeding diphenylhydantoin (DPH), a reported microsomal enzyme inducer and clinical drug. Levels of 10 and 100 ppm. DPH in the diet had no effect on feed intake, body weight gain, or appearance when fed to chickens 6 to 9 weeks of age. Birds fed 1000 or 2500 ppm DPH manifested a hemorrhagic syndrome, marked excitability, and a condition mimicking the stance of encephalomalacia. Packed cell volume, rbc and hemoglobin values were also significantly reduced. Subsequently, a no-effect (100 ppm level) and borderline-effect (250 ppm level) dose were selected to determine the withdrawal rate of DDT in chickens fed 2.5 or 15.0 ppm of the pesticide. DDT and DDE levels in adipose tissue did not decline faster in DPH-treated chickens previously fed 2.5 or 15.0 ppm DDT for 5 weeks. However, livers from DPH-treated chickens showed faster withdrawal rates of DDD from livers of chickens fed 15.0 ppm DDT, and the response was related to DPH levels in the diet. (Author abstract by permission)

75-0203. Kenaga, E. G. (Dow Chem. Co., Midland, MI). **Evaluation of the safety of chlorpyrifos to birds in areas treated for insect control.** *Residue Rev. 50(1): 1-41; 1974.* (62 references)

Chlorpyrifos is used for control of lawn and turf pests and mosquitoes. Chlorpyrifos residues on representive plants treated at 1 lb/A are below 27 ppm initially and decrease rapidly thereafter. Residues on plants, with a half life of one to two days, do not build up from normally scheduled repeated applications. Such residues are representative of levels expected in the food of birds from areas treated with chlorpyrifos. The no-effect level for bird mortality and reproduction is from 30 to 300 ppm chlorpyrifos at a constant level in the daily diet, based on 5-28 days of feeding. No teratogenic effects were noted in chicks that hatched from eggs laid by chickens fed chlorpyrifos in their diet. Residues in birds exposed to sublethal amounts of chlorpyrifos by dietary intake or contact did not develop toxicologically signficant residues, and residues declined rapidly after exposure stopped. No deaths were observed among birds confined to ground plots treated with chlorpyrifos at 4-32 lb/A. The principal metabolite of chlorpyrifos, 3,5,6-trichloro-2-pyridinol, is much less toxic than the parent compound. No evidence of bird mortality or effects on birds have been reported from field trials of chlorpyrifos against mosquitoes or from wide-scale commercial usage of chlorpyrifos on lawns and water bodies. (Author abstract by permission, abridged)

75-0204. Foster, T. S. (Anim. Res. Inst., Res. Br., Agr. Canada, Cent. Exp. Farm, Ottawa, Ontario K1A OC6, Canada). **Physiological and biological effects of pesticide residues in poultry.** *Residue Rev. 51: 69-121; 1974.* (232 references)

Some pesticides and their residues cause adverse effects in poultry. Injection of pesticides into the yolk of fertile eggs showed that most organophosphorus insecticides produced teratogenic effects. In general, no deformities occurred in chicks from eggs from hens fed rations containing pesticides. Exceptions were the carbamate carbaryl and the fungicide Arasan. The fumigant ethylene dibromide, the fungicides Arasan, zineb, ziram, and thiram and the coccidiostats Nicarbazin and Polystat-3 caused a decrease in egg size and eventually cessation of laying. Ingestion of organochlorine insecticides did not cause thin eggshells in poultry when a nutritionally balanced diet containing at least three percent calcium was fed. The fungicides Arasan, ziram, and zineb, used as seed dressings, have disastrous effects on shell thickness. Fertility and hatchability of eggs were decreased by ingestion or injection of a number of organochlorine insecticides, PCBs, organophosphorus pesticides, carbaryl, certain herbicides, and ethylene dibromide. Estrogenic and androgenic effects were seen in Japanese quail, pheasants, and mallard ducks fed Kepone and other chlorinated polycyclic insecticides. Evidence has accumulated that DDT and other organochlorine insecticides affect hepatic microsomal enzymes and thus oxidation, reduction and/or hydrolysis of foreign compounds, including pesticides. Cholinesterase activities were inhibited by most organophosphorus and several carbamate pesticides. Finally, some pesticides affect adrenal glands, adrenal steroids, various vitamins, blood analyses, and organ weights. (Author abstract by permission, abridged)

75-0205. Anderson, C. A.; Cavagnol, J. C.; Cohen, C. J.; Cohick, A. D.; Evans, R. T.; Everett, L. J.; Hensel, J.; Honeycutt, R. P.; Levy, E. R.; Loeffler, W. W.; Nelson, D. L.; Parr, T.; Waggoner, T. B.; Young, J. W. (Chemagro Divison of Baychem Corp., Kansas City, MO 64120). **Guthion (azinphosmethyl): organophosphorus insecticide.** *Residue Rev. 51: 123-180; 1974.* (112 references)

Guthion (azinphosmethyl) is used against many insects on many crops. It has low dermal toxicity, low

phytotoxicity, and rapid pre-harvest dissipation. Few insects have shown resistance to guthion despite its widespread use. Because of its specificity against many pests, guthion is suitable for use in integrated control programs. Guthion is metabolized rapidly in animals, and its lifetime in plants is relatively short. It is not systemic in plants. Guthion has a short lifetime in water and breaks down in soil. It is tolerated well by wildlife, but is toxic to fish. As a result of its low dermal toxicity, guthion has been registered for use in the home garden in a special formulation. An extensive list of food crop tolerances and registrations for guthion has been prepared. (Author abstract by permission, abridged).

75-0206. Murakami, M.; Fukami, J. (Inst. Phys. Chem. Research, Yamato, Saitama, Japan). **[Binding of some pesticides to DNA and protein.]** *Seikagaku (J. Jap. Biochem. Soc.) 46(8): 650; 1974.* (2 references) (Japanese)

In order to elucidate the toxicity of some insecticides in the environment, the binding of ^{14}C-labeled insecticides (DDT, chlordimeform, fenitrothion, etc.) to calf thymus DNA and bovine serum albumin was evaluated. Binding was determined by incubating the combined materials, extracting the unreacted insecticides and precipitating the reacted DNA or albumin. The radioactivity of the reacted DNA and albumin showed that chlordimeform had a binding to tendency to DNA and albumin as small as that of DDT. The results obtained to date indicate that insecticides generally bind more preferably to albumin than to DNA. (Lecture presented at XLVII Annual Meeting of Jap. Biochem. Soc., Oct. 9-12, Okayama.)

75-0207. Matsueda, S.; Sasaki, K. (Fac. General Culture, Hirosaki Univ., Hirosaki, Aomori, Japan). **[Effect of an SH-releasing compound, cystein, on blood cholinesterase inhibited by organophosphorus pesticides.]** *Seikagaku (J. Jap. Biochem. Soc.) 46(8): 651; 1974.* (1 reference) (Japanese)

Blood collected from a healthy person was inhibited by adding parathion or methyl parathion in vitro, and after adding L-cystein, the activities of true and pseudo-cholinesterase were determined. These values were compared to the effects after addition of PAM. The normal erythrocyte cholinesterase activity value of 0.53 ± 0.05 units was inhibited by parathion to 0.33 ≧ or - 0.06, and was restored by L-cystein to 0.46 + or - 0.17. Serum cholinesterase activity, once inhibited by parathion, was not restored by the action of L-cystein, but was further inhibited. Erythrocyte cholinesterase activity, once inhibited by methyl parathion, was slightly but not significantly restored by L-cystein. Serum cholinesterase activity, once inhibited by methyl parathion, was further inhibited by L-cystein. The results of recovery experiments adding L-cystein to washed, inhibited erythrocytes were reported, as well as the results of animal experiments in vivo.

75-0208. Kada, T. (National Institute of Genetics, Mishima, Shizuoka, Japan). **[Mutagenicity testing of chemicals, its detection and meaning.]** *Tokyo Igaku Zasshi (Tokyo J. Med. Sci.) 82(3): 223-231; 1974.* (16 references) (Japanese)

After introducing the concept of mutagenesis by chemical substances, the article outlines a procedure for detecting mutagenicity, including tests utilizing microorganisms (rec-assay method and reversion method), yeasts, silkworms, drosophila, and dayflower. Other methods directly detect chromosomal anomalies and some utilize mammals such as mice (dominant lethal method, specific gene locus method and host-mediated assay). Although it is difficult to evaluate the results on experimental animals in connection with the effects on human beings, it must be noted that there is no difference between DNA from bacteria and DNA from humans regarding its response to chemicals. Some pesticides (not specifically mentioned) have been found to be strong mutagens of the frameshift type.

75-0209. Koizumi, A.; Dobashi, Y.; Tachibana, Y.; Tsuda, K.; Morimoto, K. (Dept. Human Ecology, School Health Sci., Fac. Med., Tokyo Univ., Tokyo, Japan). **[Chromosome aberrations included by chemical agents.]** *Tokyo Igaku Zasshi (Tokyo J. Med. Sci.) 82(3): 232-244; 1974.* (51 references) (Japanese)

The biochemical mechanism of chromosomal aberratory disturbances is based on a change in the DNA molecule, so that all factors within or outside of the cell altering DNA act to promote mutagenesis. Some of the exogenous factors which induce mutagenesis, i.e., chemical substances, are classified by their actions as follows: substances competing with nucleic acids, substances which act directly on nucleic acid bases, dyestuffs, and substances which inhibit the synthesis of nucleic acids. The article mentions a table prepared by Shaw, which describes about 200 kinds of clastogens which act on plant and animal cells. The table contains the following pesticides: apholate, aziridine, captan, DDT, Hemal, hempa, maleic hydrazide, tretamine, triethylenemelamine, triethylene phosphoramide, triethylenethiophosphoramide, and trimethylenephosphoramide.

75-0210. Becker, D. (Dept. of Anat., Freie Univ., Berlin, Germany). **The effect of folate overdose and of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on kidney and liver respectively of rat and mouse embryos.** *Teratology 8(2): 215; 1973.*

The main interest of teratology concerns malformation arising by influence of teratogenic substances during the critical periods. After this time damages of different tissues may occur even if there are no significant malformations. Overdose of folate (500 mg/kg) will cause tubule damage in kidneys of mice and rats (disintegration of microvilli, fragmentation of cell

membranes, formation of casts). This kind of damage also appears in embryo kidneys whereby nephrons with a certain degree of maturity are concerned. The substance TCDBD (dioxin) produces in adult animals an extreme fatty degeneration of the liver. After application of TCDBD on day 13-15 of gestation in rats fatty inclusions will be seen also in embryonic livers without other changes of structure. Studies on reversibility of these changes are provided. (Author abstract by permission)

See also 75-0003 75-0044 75-0048 75-0052 75-0055

75-0211. Ott, D. E.; Gunther, F. A. (Dept. Entomol., Univ. California, Riverside, CA 92502). **Automated wet chemical microcoulometric analyzer for chloride ion.** *Bull. Environ. Contam. Toxicol. 12(2): 161-166; 1974.* (6 references)

An automated system for the rapid, reproducible analysis of chloride ion in aqueous samples is described. The system makes use of a combination of the Auto-Analyzer and commercial microcoulometric titration modules. The system is applicable to the analysis of organochlorine compounds which have been combusted in a Schoniger flask or in a furnace with combusted products collected in chloride-free distilled water. Replicated furnace combusted samples consisting of μg to mg amounts of dieldrin yielded precise and reproducible results with 90 ± 4% chloride ion recovery. The analysis of aqueous chloride ion is possible provided interferences such as bromide, iodide, and fluoride ions are not present. The analyzer was designed especially for the chloride ion derivable by various means from organochlorine pesticides.

75-0212. Hattula, M. L. (Dept. Chem., Univ. Jyvaskyla, Jyvaskyla, Finland). **Some aspects of the recovery of chlorinated residues (DDT-type compounds and PCB) from fish tissue by using different extraction methods.** *Bull. Environ. Contam. Toxicol. 12(3): 301-307; 1974.* (19 references)

In this study four solvent systems were studied and used as cold extraction in glass columns and as hot extraction in Soxhlet apparatus. The four systems included: diethyl ether; diethyl ether and *n*-pentane 1:1 (v/v); 25% *n*-hexane in acetone and 10% diethyl ether in petroleum ether 1:1 (v/v); and methanol and chloroform 1:1 (v/v). The fish studied were pike, perch, and bream from the northern part of the Baltic Sea and represented lean, medium fatty, and fatty fish, respectively. It was determined that the factors affecting the final results are mainly the extraction process, clean-up, and the determination by gas liquid chromatography. The results clearly showed that cold extraction is not comparable with hot extraction, at least when the residue concentration of material is low. Great variation was noted in the fat extraction process even when homogeneous material is extracted. Thus, it is essential that the extraction method be tested for different materials and when the results are given, the limits of error which are statistically tested should be included.

75-0213. Hattula, M. L. (Dept. Chem., Univ. Jyva kyla, Jyvaskyla, Finland). **Simultaneous clean up of fish fat containing low levels of residues and separation of PCB from chlorinated pesticides by thin-layer chromatography.** *Bull. Environ. Contam. Toxicol. 12(3): 331-337; 1974.* (24 references)

A method is described for monitoring the contamination of water ecosystems by PCB at low levels of less than 0.05 ppm and total DDT plus DDT derivatives at less than 0.01 ppm in the wet weight of the tissue of fish. The method, a TLC procedure which is described fully, enables small amounts of fat containing low residue levels to be treated with a minimum amount of equipment and solvents for clean up and separation before the final analysis on GLC. The method serves as a supplementary method for sulfuric acid clean up in which PCB and DDT-type compounds remain unaffected, but the epoxide structures are destroyed. This method has been used in cases when the fat yield is low in the residue analyses of plankton, bottom invertebrates, and water plants and when the amount of fat is limited, less than 10 mg.

75-0214. Koen, J. G. (Univ. of Amsterdam, Amsterdam, The Netherlands). **Continuous polarographic detection in column liquid chromatography with use of the polarographic detector.** *Diss. Abstr. Int. 35(3): 1177B; 1974.*

Microdetectors were designed for use in connection with high-speed, high efficiency column liquid chromatography, and were applied to analysis of mixtures of nitro group-containing pesticides. Pesticide analysis times can be reduced considerably by the use of high-speed liquid chromatographic columns. Either polarographic detectors, based on the dropping mercury electrode, or voltammetric detectors using fixed platinum microelectrodes may be used. The polarographic microdetector developed was examined in analyzing mixtures of parathion, methyl parathion, and *p*-nitrophenol in crop extracts. Concentrations in the order of 10^{-8} mol/l can be determined in a few minutes. A standard deviation of better than 2% can be achieved in quantitative analysis. The ternary system water:ethanol:2,2,4-trimethylpentane was evaluated with respect to the separation of 18 pesticides containing nitro groups in the molecule. Criteria for the choice of a phase system are discussed. Partition coefficients for the pesticide compounds and oxygen are determined. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order no. 74-31,313.)

75-0215. Popov, M. D.; Angelova, Y. M.; Krantova, S. G. (M. Popov Inst. Plant Physiol., Bulgarian Academy of Sciences, Sofia, Bulgaria). **Determination des quantites residuelles d'hydrazide maleique dans les fueilles de tabac. [Determination of maleic hydrazide residues in tobacco leaves.]** *Dokl. Bolg. Akad. Nauk 26(6): 819-821; 1973.* (10 references) (French)

Maleic hydrazide residues were studied on tobacco leaves collected at different times after dusting. Residues averaged 0.064-0.138 mg/kg on tobacco leaves collected between the eighth and 46th days after dusting at a rate of 30-90 mg maleic hydrazide per plant. The maximum allowable maleic hydrazide concentration in potatoes and vegetables is 14 mg/kg. Thus, the maleic hydrazide

residues found in dried tobacco leaves can be rated as negligible. Since maleic hydrazide is decomposed at 300-310°C and a burning cigarette tip may reach a temperature of up to 870°C, maleic hydrazide does not increase the harmful effect of tobacco in cigarettes.

75-0216. Popov, V. I.; Sboyeva, Zh. N. (All-Union Sci. Res. Inst. Plant Protection, USSR). **Kolichestvennyy metod opredeleniya benomila v list'yakh khlopchatnika. [Quantitative determination of benomyl in cotton leaves.]** *Dokl. Vses. Akad. Sel'skokhoz. Nauk 10: 19-20; 1973.* (12 references) (Russian)

A simple microbiological method is described for the routine quantitative determination of benomyl residues in cotton leaves. Homogenized leaf samples are placed on filter paper which lies on Capek's agar previously inoculated with *Verticillium dahliae* Kleb. The benomyl concentration is determined from the dimension of the zone in which the growth of the fungi is inhibited by benomyl. A calibration curve is used to determine the relationship between the extension of the inhibition zone and the benomyl concentration. Determinations of benomyl contents in cotton leaves showed the fungicide present throughout the vegetation period in leaves. It was not detected in boll leaves, seeds, and fibers.

75-0217. Shinova, R. P. (Sanit. Hyg. Lab., Sanit. Epidemiol. Station of the Nikolayevsk Region, Nikolayevsk, USSR). **Razdel'noye opredeleniye pestitsidov metodom tonkosloynoy khromatografii na plastinkakh "Silufol". [Separate determination of pesticides by thin-layer chromatography on ready-made "Silufol" sheets.]** *Gig. Sanit. 39(7): 52-53; 1974.* (1 reference) (Russian)

A sensitive routine method is described for the detection and semiquantitative separate determination of DDT, BHC, polychloropinene, 2,4-D, and trichlorfon residues by thin-layer chromatography on ready-made Silufol sheets. Following extraction by the conventional technique with sulfuric ether and clean-up, the samples are transferred onto Silufol layer in *n*-hexane or diethyl ether. Up to six samples can be applied on the Silufol layer along with corresponding standards. The Silufol layer is then exposed to vapors of a solvent system composed of 10:4:0.3 ratio of *n*-hexane, methanol, and ammonia. Silver nitrate in acetone is used as a visualizing agent in UV light. The retention times were determined to be 1 for DDT, 0.8 for BHC, 1 for polychloropinene, 0.6 for 2,4-D, and 0.4 for trichlorfon. Semiquantitative determination is possible by the color intensity and extension of the spots. The sensitivity amounts to 0.2 μg for polychloropinene, 0.5 μg for DDT, 2 μg for trichlorfon, and 5 μg for BHC and 2,4-D.

75-0218. Koshcheyev, A. K.; Livshits, O. D. (Perm Med. Inst., Perm, USSR). **Ekspressnyye lyuminestsentnyye metody obnaruzheniya ostatochnykh kolichestv sevina vo vneshney srede. [Rapid luminescence method for detecting carbaryl residues in the environment.]** *Gig. Sanit. 39(8): 57-58; 1974.* (3 references) (Russian)

Rapid routine luminescence methods for the detection and quantitative determination of carbaryl in air, water, and biological materials are presented. Carbaryl deposits on plant leaves, skin, and other objects are detected by wiping the objects with absorbent cotton saturated with an aqueous solution of sodium hydroxide. Similar absorbent cotton or Petri's absorber is used in air sampling for the detection of carbaryl. Carbaryl can be detected directly in water in concentrations over 0.001 mg/liter, while lower concentrations require extraction with benzene. The enriched sample is then mixed with sodium hydroxide for luminescence analysis. Carbaryl is extracted from cotton-seed oil with butyl alcohol, while benzene is used for extraction from fruits and vegetables. The luminescence detection of carbaryl in the different samples is based on the luminescence generated by this compound under UV light in the presence of aqueous sodium hydroxide. Quantitative determination of carbaryl by the fluorescence method is possible by comparison with reference standards.

75-0219. Subba Rao, C. V.; Viswanadham, N. (Dept. Pharmacy, J. V. D. Coll. Sci. Technol., Andhra Univ., Waltair, India). **Pesticidal contamination of spices—examination of dry chillies grown in Andhra Pradesh.** *Indian J. Pharm. 35(6): 207; 1973.*

A simple method has been devised for the isolation and identification of residues of widely used organochlorine (DDT, BHC, endrin) and organophosphorus (dimethoate, malathion, parathion and methyl parathion) insecticides in dry chilli powders using chromatographic methods. The organochlorine residues from powdered chilli samples are extracted with hexane:acetone (4:1) solvent mixture, and the interfering materials are removed by passing the extract through a short column of alumina and eluting with hexane. They are identified by thin-layer chromatography, using heptane:toluene (9:1) as developing system and 0.5% diphenylamine and 0.1% silver nitrate as chromogenic spray reagents and exposing to germicidal UV light for 5 min. The organophosphorus residues are extracted with chloroform, and interfering materials are removed by column chromatography using chloroform as eluting solvent. They are identified by TLC, using chloroform as developing solvent and 0.2% bromophenol blue + 0.15% silver nitrate as chromogenic spray reagents and then exposing to iodine vapor. The minimum detectable limits are compared with authentic samples of pesticides.

75-0220. Nash, R. G. (Agr. Environ. Qual. Inst., Agr. Res. Serv., USDA, Beltsville, MD 20705). **Pesticide**

residues. Improved gas-liquid chromatographic method for determining ethylenethiourea in plants. *J. Ass. Offic. Anal. Chem. 57(5): 1015-1021; 1974.* (14 references)

In the improved method for determining ethylenethiourea (ETU) in plants, pentafluorobenzoyl chloride was substituted for trifluoroacetic anhydride derivatization of *S*-benzylated ETU. The resulting product (2-(benzylthio)-1-(pentafluorobenzoyl)-2-imidazoline) gave recoveries of near 100% and improved the electron capture gas-liquid chromatographic (GLC) response. The product can be cleaned up by column chromatography to eliminate interfering GLC peaks. Soybeans grown in soil treated with ^{14}C-ETU resulted in a high concentration of ^{14}C residues in leaves, but only traces of ETU were detected by either ^{14}C or GLC measurements. (Author abstract by permission)

75-0221. Lawrence, J. F.; Laver, G. W. (Food Res. Lab., Health Protect. Branch, Tunney's Pasture, Ottawa, Ontario, Canada K1A OL2). **Analysis of carbamate and urea herbicides in foods using fluorogenic labeling.** *J. Ass. Offic. Anal. Chem. 57(5): 1022-1025; 1974.* (32 references)

A procedure using fluorogenic labeling for the analysis of carbamate and urea herbicides in several food types has been developed. Extracted herbicides are hydrolyzed to their corresponding anilines, which are then labeled with dansyl chloride (1-dimethylaminonaphthalene-5-sulfonyl chloride). The reaction is carried out on a thin-layer plate which is subsequently developed, and the separated spots are either scanned for fluorescence or are removed from the layer and quantitatively analyzed in solution by fluorometry. As low as 0.05 ppm herbicide can be detected with no interference from coextractives. Other than a single partition step from the extracting solvent no cleanup is required. The method may be used for confirmation of the identity of a number of carbamate and urea herbicides, as a quantitative analytical technique where equipment is available, or as a method for screening where only the knowledge of herbicide presence is required. (Author abstract by permission)

75-0222. Ismail, R. J.; Bonner, F. L. (Feed and Fertilizer Lab., Louisiana State Univ., Harry D. Wilson Bldg., Baton Rouge, LA 70803). **New, improved thin layer chromatography for polychlorinated biphenyls, toxaphene, and chlordane components.** *J. Ass. Offic. Anal. Chem. 57(5): 1026-1032; 1974.* (15 references)

Reverse phase partition thin-layer chromatography is described for the separation of the different components in polychlorinated biphenyl compounds, chlordane, and toxaphene. Plates prepared from washed aluminum oxide, with silver nitrate incorporated into the layer, are saturated with a nonpolar solvent (immobile phase), air-dried overnight, and spotted. A mixture of polar solvents is used as the mobile phase. After exposure to longwave ultraviolet light, dark blue silver chloride spots form on a white background. As little as 1 μg Aroclor can be detected by this method, which can be applied for qualitative and semiquantitative measurements. Distinct patterns are obtained for Aroclor reference materials which are resolved from most DDT analogs and other commonly occurring chlorinated pesticides. Since the use of infrared, ultraviolet, nuclear magnetic resonce, and mass spectroscopy as supplementary methods for qualitative analysis involves a large capital outlay which is often beyond the resources of small laboratories, the technique is most valuable to the chemist in such laboratories where time and money are important factors. (Author abstract by permission)

75-0223. Ripley, B. D.; Wilkinson, R. J.; Chau, A. S. Y. (Canada Centre for Inland Waters, Water Qual. Br., P.O. Box 5050, Burlington, Ontario, Canada L7R 4A6). **Multiresidue analysis of fourteen organophosphorus pesticides in natural waters.** *J. Ass. Offic. Anal. Chem. 57(6): 1033-1042; 1974.* (17 references)

A method is described for the determination of 14 organophosphorus pesticides in natural waters at less than μg/l (ppb) concentrations. Two extraction methods are described: the vortex stirring method for water that forms light emulsions and the separatory funnel method for water that forms heavy emusions during extraction. Extraction recoveries were 95–110% for all compounds except crufomate (115%). Two concentration methods are also described with recoveries of 95–116%. Compounds were determined by isothermal gas chromatography using a flame photometric detector that is quantitatively sensitive to phosphorus. The sensitivity of the method for most of the 14 compounds was 0.01 ppb, using 1 l. water. Retention times of all compounds were constant during isothermal analysis. Possible losses due to storage were also examined. (Author abstract by permission)

75-0224. Bhagwat, V. M.; Ramachandran, B. V. (Biochem. Div., Nat. Chem. Lab., Poona 8, India). **Estimation of malaoxon in the presence of malathion by the ferric hydroxamate method.** *J. Ass. Offic. Anal. Chem. 57(5): 1043-1045; 1974.* (10 references)

Both malathion and malaoxon are completely extractable from aqueous suspensions by benzene-isobutanol (1+1). Aliquots of the extract are evaporated at 110-120°C, the residue is dissolved in methanol, and the total ferric hydroxamate color is determined. Extraction of a second aliquot with cyclohexane removes malathion and some malaoxon. Malaoxon is selectively partitioned from cyclohexane into alkaline hydroxylamine, leaving only malathion in the cyclohexane phase. After the cyclohexane phase is evaporated, the amount of malathion can be estimated by the ferric hydroxamate method. The difference in the

color for the benzene-isobutanol extract and the cyclohexane extract represents that due to malaoxon; the amount of malaoxon may be calculated from a standard curve. The method, sensitive to about 0.2 μmole malaoxon, is useful for monitoring the laboratory preparation of malaoxon from malathion. (Author abstract by permission)

75-0225. Larose, R. H. (Canada Centre for Inland Waters, P.O. Box 5050, Burlington, Ontario, Canada, L7R 4A6). **High-speed liquid chromatographic cleanup of environmental samples prior to the gas chromatographic determination of lindane.** *J. Ass. Offic. Anal. Chem. 57(5): 1046-1049; 1974.* (7 references)

A method is described which permits the removal of interfering co-extractives from lindane, using high-speed liquid chromatography. Fractions are collected from the liquid chromatograph for further analysis by gas-liquid chromatography. The cleanup procedure takes less than 5 min and recoveries of more than 90% are obtained. The detection limit for water samples is 5 ng/l. (Author abstract by permission)

75-0226. Holmstead, R. L.; Casida, J. E. (Div. of Entomol. and Parasitol., Univ. of California, Berkeley, CA 94720). **Chemical ionization mass spectrometry of organophosphorus insecticides.** *J. Ass. Offic. Anal. Chem. 57(5): 1050-1055; 1974.* (8 references)

The chemical ionization (CI) mass spectra of 15 important organophosphorus insecticides and 14 of their major metabolites are discussed in relation to the effect of chemical structure on fragmentation patterns. The fragments obtained with CI are sometimes quite different from those formed on electron impact and, in general, simpler spectra are obtained with CI. (Author abstract by permission)

75-0227. Currie, R. A. (Food Lab., Alberta Dept. of Agr., Edmonton, Alberta, Canada T6H4P2). **Determination of leptophos, leptophos oxon and a possible phenolic photoconversion metabolite in rapeseed grain.** *J. Ass. Offic. Anal. Chem. 57(5): 1056-1060; 1974.* (5 references)

Whole rapeseed grains were extracted with water-acetonitrile. Following partitioning of leptophos and its 2 metabolites into petroleum ether, the sample extract was cleaned up by graded elution on a silica gel column. The first fraction contained leptophos (*O*-(2,5-dichloro-4-bromophenyl) *O*-methyl phenylthiophosphonate) and its phenolic metabolite (2,5-dichlorophenol analog of leptophos) which were determined by using a gas chromatograph equipped with a flame photometric detector (526 nm filter). Leptophos oxon was eluted from the silica gel column in a second fraction and determined by using thin layer chromatography and enzyme inhibition detection. Recoveries ranged from 85.6 to 96.7% for leptophos and from 83.4 to 96.9% for its phenolic metabolite at the 2 ppb fortification level. Within the limits of the detection system, leptophos oxon was recovered quantitatively at the 10 ppb level. (Author abstract by permission)

75-0228. Bowman, P. B.; Dame, P. W. (Control Anal. Res. and Dev. Lab., Upjohn Co., Kalamazoo, MI 49001). **Gas-liquid chromatography of trichlorfon in soluble powder formulations.** *J. Ass. Offic. Anal. Chem. 57(5): 1128-1131; 1974.* (5 references)

A procedure is described for the determination of trichlorfon in a soluble powder formulation by gas-liquid chromatography. Silylation prevents on-column degradation of trichlorfon to dichlorvos. The procedure provides quantitative recovery from the formulation as demonstrated by a spiking study. A relative standard deviation of less than 2% was obtained for 6 replicate assays of a single lot of formulation. The mass spectral fragmentations of trichlorfon and trichlorfon-trimethylsilyl ether are described. (Author abstract by permission)

75-0229. Oswald, E. O.; Albro, P. W.; McKinney, J. D. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Utilization of gas-liquid chromatography coupled with chemical ionization mass spectrometry for the investigation of potentially hazardous environmental agents and their metabolites.** *J. Chromatogr. 98(2): 363-448; 1974.* (313 references)

The use of gas chromatography and gas chromatography-mass spectrometry (GC-MS) has been reviewed as analytical techniques for the chemist concerned with the environmental health problems of man. Some of the more important potentially hazardous environmental agents and their metabolites were viewed through the eyes of chemists with respect to the areas of analysis, synthesis, chemical reactivity, and metabolism in biological systems. Specific examples using various types of environmental agents were chosen to illustrate the advantages and/or limitations of data from GC and GC-MS. A detailed discussion was given of the complementary utilization of electron impact and chemical ionization mass spectromety for quantitation of various types of compounds of environmental significance. The review was concluded with the views of chemists using GC-MS in solving problems associated with environmental effects on health. Obtaining structural and quantitative data on submicrogram amounts of potentially hazardous chemicals is prerequisite to understanding the problems produced by a compound.

75-0230. Leshchev, V. V.; Talanov, G. A. (All-Union Sci. Res. Inst. Vet. Sanit., USSR). **Podbor proyavlyayushchikh reagentov i podvizhnykh rastvoriteley dlya opredeleniya fosfororganicheskikh insektitsidov metodom tonkosloynoy khromatografii. [Selection of**

reagents and solvents for TLC determination of organophosphorus insecticides.] *Khim. Sel. Khoz. 12(6): 47-50; 1974.* (Russian)

Various visualizing reagents and solvents for the thin-layer chromatographic determination of organophosphorus insecticides were studied. Acetone, chloroform, hexane, benzene, and methanol were used as solvents. Detection with bromphenol blue and silver nitrate on silica gel, sodium hydroxide and silver nitrate solution, and the enzymatic method using horse serum, sodium hydroxide, bromthymol blue, and acetylcholine chloride produced rather low sensitivity for most of the pesticides tested. High sensitivity was achieved by another method using liquid petrolatum in diethyl ether on a cellulose layer for subsequent UV irradiation. The best results were obtained by separation on ready-made silufol layers and visualization with a 0.7% solution of 2,6-dibromo-*N*-chloro-*p*-quinone imine in hexane or chloroform and subsequent simultaneous irradiation with UV and IR light. The sensitivity of this method amounted to 0.05-0.1 μg for most thiophosphoric and dithiophosphoric acid derivatives, but this method was not suitable for the determination of dichlorvos, naled, crufomate, crotoxyphos, and trichlorfon. A 15:5:1 ratio of hexane-acetone-chloroform is recommended as solvent system for such pesticides as trichlorfon, dimethoate, crufomate, dichlorvos, naled, crotoxyphos and phosmet. Hexane and acetone in a 4:1 ratio or a 15:5:0.5 ratio of hexane-acetone-chlorform is recommended for fenitrothion, fenthion, diazinon, and chlorpyrifos.

75-0231. Stec, J.; Juszkiewicz, T. (Dept. Pharmacol. Toxicol., Vet. Inst., Pulawy, Poland). **Oznaczanie pozostalosci insektycydow polichlorowych w produktach zwierzecych z zastosowaniem metody Wooda. [Determination of polychlorinated insecticide residues in animal products using Wood's method.]** *Med. Wet. 28(10): 634-637; 1972.* (12 references) (Polish)

Wood's method (slightly modified) is recommended for determining residues of polychlorinated insecticides in samples of fat, muscle, liver, brain, milk, and eggs. After extraction with petroleum ether or dimethylsulfoxide (DMSO) the extract is mixed with celite and placed on a chromatographic column. The insecticide residues are eluted from the columns with a small amount of DMSO which is absorbed on a second chromatographic column filled with florisil. The insecticides are then extracted from the DMSO with petroleum ether and the extract is ready for analysis by gas or thin layer chromatography. In the original Wood's method, hexane is used instead of petroleum ether. Recovery of *p,p'*-DDT, *p,p'*DDE, *p,p'*-DDD (TDE), *p,p'*-DMDT (methoxychlor), γ-BHC, and dieldrin with this method compared favorably to that obtained by other methods, and the method described is simple and relatively inexpensive.

75-0232. Stijve, T.; Cardinale, E. (Nestle Prod. Technical Assistance Co., Ltd., La Tour-de-Peilz, Switzerland). **Rapid determination of chlorinated pesticides, polychlorinated biphenyls and a number of phosphated insecticides in fatty foods.** *Mitt. Geb. Lebensmitteluntersuch. Hyg. 65(1): 131-150; 1974.* (14 references)

A rapid, one-step method for the determination of residues of chlorinated pesticides, PCBs, and 6 organothiophosphates in fatty foods has been developed. Fats and oils are cleaned up by placing a quantity not over 1 g on top of a chromatographic column composed of partly deactivated Florisil. For analysis of milk, dairy products, eggs, egg yolk powder, cocoa powder and chocolate, an absorption clean-up is performed. Tentative identification and quantitation of the residues are obtained by gas chromatography on two high efficiency columns. Confirmatory analysis is conducted by thin-layer chromatography. Chlorinated compounds are shown by photochemical reaction with silver nitrate, whereas detection of organothiophosphates is achieved by an esterase inhibition procedure. The lower limit of detection of chlorinated pesticides is 0.001 ppm, with the exception of toxaphene which can only be determined at levels not lower than 0.2 ppm. Non-polar phosphate pesticides and PCBs can be detected if their levels exceed 0.05 ppm, provided the sample extract to be subjected to gas chromatography represents not less than 1 g of fat per ml.

75-0233. Matsui, M.; Matano, O.; Goto, N. (Dept. of Chem., Zanryu Noyaku Kenkyusho, Kodaira, Tokyo, Japan). **[Residue analysis of kelthane in hops.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 69; 1974.* (1 reference) (Japanese)

Methods of determining residual kelthane in hops were examined. Although hops contain considerable amounts of substances which interfere in the determination of kelthane by GLC-ECD, the use of column chromatography with silica gel and sweep co-distillation could facilitate the determination. After extracting the specimen with *n*-hexane and transferring the extract to acetonitrile, the acetonitrile solution was subjected to silica gel chromatography and then to sweep co-distillation after condensing and dissolving in petroleum ether. The eluate was condensed and was subjected to column chromatography on Florisil. The eluate from the column, after condensing, was determined by GLC-ECD. The detection minimum was 0.05 ppm; the average recovery was 87.8% when 2 ppm of kelthane was added. (A Lecture presented at XVII Meeting on Pesticide Research, Aug. 21, 1974, Tokyo)

75-0234. Nomiyama, M.; Ikeda, T. (Hiroshima Factory, Mikasa Chem. Ind. Co., Ltd., Hiroshima, Japan). **[Gas chromatographic analysis of *N*-methylcarbamate insecticides.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 70-71; 1974.* (1 reference) (Japanese)

Methods for determining six kinds of *N*-methylcarbamates (propoxur, osbac, 2-isopropylphenyl-*N*-methylcarbamate, maqbarl, MTMC, and meobal) were studied as quality control analytical methods. Gas chromatography with FID using 10% DEGS or 20% QF-1/Chromosorb W(AW, DMCS) as column materials at a column temperatures of 135-140°C and an inlet temperature of 130-135°C, nitrogen carrier flow rate of 100 ml/min, hydrogen at 60 ml/min, and air at 80 ml/min, was appropriate for avoiding decomposition. The average analytical values (purity) of technical material of the six *N*-methylcarbamates, with standard deviations and coefficients of variation were, respectively in the above order: 40.7%, 0.62, 0.63; 98.0%, 0.88, 0.90; 98.6%, 0.56, 0.57; 98.4%, 0.70, 0.71; 96.4%, 0.65, 0.67; 97.5%, 0.45, 0.46 when n=5. The results of determination of a formulation of 1% propoxur powder revealed an average content of a.i. of 1.185% with standard deviation of 0.018 and coefficient of variation of 0.93, and with recovery of 99.75% when n=5. (A Lecture presented at XVII Meeting on Pesticide Research, Aug. 21, 1974, Tokyo)

75-0235. Kobayashi, Y.; Sato, K.; Shiga, N.; Matano, O.; Goto, N. (Dept. Chem., Zanryu Noyaku Kenkyusho, Kodaira, Tokyo, Japan). **[Simultaneous qualitative and quantitative analysis of organochlorine pesticides by mass chromatography.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 72-74; 1974.* (4 references) (Japanese)

Organochlorine pesticide residues in soil were first extracted with acetone. To the filtered acetonic extract an aqueous NaCl solution was added, and the mixture was extracted with *N*-hexane. After evaporating the hexane extract a portion of the condensate was analyzed by mass chromatography (gas chromatography coupled with mass spectrometry) and the other part was subjected to column chromatography and eluted with *n*-hexane (in the case of aldrin) or with a mixture of ether and petroleum ether. Then the eluate was subjected to gas chromatography on a column packed with 1% OV-1/chromosorb at a column temperature of 190°C, with He as carrier at 30 ml/min. The minimum detectable quantity by this method was 5 ng for aldrin and dieldrin and 10 ng for heptachlor epoxide. The value determined by MC coincided with that in separate determinations. The method was applied to soil samples from Yamagata and Kanagawa; the aldrin content determined by MC was 0.049 and 0.048 ppm and by GC 0.04 and 0.04 ppm. . (A Lecture presented at XVII Meeting on Pesticide Research, Aug. 21, 1974, Tokyo)

75-0236. Kotakemori, M.; Miyaji, I.; Nomura, K.; Horichiya, J.; Uchida, T. (Yasugawa Factory, Sankyo Co. Ltd., Yasugawa, Shiga, Japan). **[Residue analysis of thiadiazines in crops and soils.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 75-76; 1974.* (5 references) (Japanese)

A method of determining a thiadiazine, 3,3-ethylene-bis(tetrahydro-4,6-dimethyl-2H-1,3,5-thiadiazine-2-thione) (Sanipar), is described. The thiadiazine is dissociated with acid to carbon disulfide, and the carbon disulfide converted to copper diethyldithiocarbamate. Then the diethylcarbamate was determined by spectrophotometry. The determination was studied under various conditions. The results were examined by analysis of variance on the factors carrier gas*, substance to be analyzed*, method of acid addition, kind of acid*, liquid for absorption of interfering substances, type of reducing agent in case of crops, concentration of sulfuric acid, presence or absence of reducing agent*, velocity of suction of carrier gas*, and time of heating in case of soils). The asterisked factors were found to be significant. Although the reaction between carbon disulfide, dialkylamine, and the copper salt forms two kinds of chelates, it was established by TLC that the present method yielded only copper diethyldithiocarbamate. The detection minimum was 0.1 ppm, with recovery rates of 64-95% in crops (0.2-0.5 ppm added) and of 64-74% in soils (2.0 ppm added). (A Lecture presented at XVII Meeting on Pesticide Research, Aug. 21, 1974, Tokyo)

75-0237. Sawabe, S.; Ameya, K.; Sakai, J.; Matsumoto, J. (Nihon Soda Co., Ltd., Tokyo, Japan). **[A simple method of determining maneb in its formulations.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 77-78; 1974.* (Japanese)

A method of determining the content of manganese ethylenebis(dithiocarbamate) in its formulations by treating the formulation with an alkaline solution to convert the active ingredient to a water-soluble sodium salt and measuring the extinction at 285 nm was examined. Although two sharp and clear extinction maxima appeared at 285 and 260 nm, other active ingredients such as Topsin M (thiophanate-methyl) and triazines and their decomposition products interfered at 285 nm. Interferences could be eliminated by changing the alkaline reagent from NaOH to Na_2CO_3 and using a mixture of ethyl acetate and chloroform as the extracting solvent for the sodium salt. The present method gave the same results as those obtained by the conventional method. The recovery was 99.70% and the standard deviation was less than 0.5%. The time required for one specimen is one third that with the conventional method. The present method would be useful industrially. (A Lecture presented at XVII Meeting on Pesticide Research, Aug. 21, 1974, Tokyo)

75-0238. Hargreaves, P. A.; Wainwright, D. H.; Hamilton, D. J. (Agr. Chem. Lab., Dept. of Primary Ind., Meiers Road, Indooroopilly, Queensland, Australia). **A method for the estimation of 1,2-dibromoethane in vegetables.** *Pestic. Sci. 5(3): 225-229; 1974.* (11 references)

Residues of 1,2-dibromoethane (EDB) were

readily estimated in treated vegetables down to levels of 0.2 mg/kg. Clean-up was effected by steam distillation into a toluene trap. This was followed by X-ray fluorescence determination of the collected EDB in the toluene. Good recoveries of added EDB were obtained at 0.5, 2, 5 and 20 mg/kg in cucumbers, pumpkins and zucchinis. (Author abstract by permission)

75-0239. Mendoza, C. E.; McLeod, H. A.; Shields, J. B.; Phillips, W. E. J. (Food Res. Lab., Health Protect. Branch, Dept. of Nat. Health and Welfare, Ottawa, Canada). **Determination of methomyl in rape seeds, oils, and meals.** *Pestic. Sci. 5(3): 231-237; 1974.* (11 references)

Methomyl added to rape seeds, oils or meals was detected by a thin-layer chromatographic-enzyme inhibition technique. The limit of detection in the presence of oil or meal extractive was 20 ng or 0.01 mg/kg. The amounts of methomyl recovered from oils and meals fortified at 0.01 to 20 mg/kg were comparable to the standard. When stored at 4°C, methomyl in oil or meals, or in chloroform extracts, was stable for at least 10 and 21 days, respectively. No degradation was observed when methomyl was heated in ethanol at 72°C for 2 h. Methomyl and its oxime were also detected with either iodo- or chloro-platinate reagent after t.l.c. The detection limits were approximately 600 ng for methomyl and 190 for the oxime. (Author abstract by permission)

75-0240. Fernandess, D. L.; Cole, J. S. (Tobacco Res. Board of Rhodesia, P.O. Box 1909, Salisbury, Rhodesia). **Comparison of solvents and methods of extracting methylbenzimidazol-2-ylcarbamate (MBC) from tobacco.** *Pestic. Sci. 5(3): 239-243; 1974.* (8 references)

The bioautographic method of Homans and Fuchs for detecting MBC on thin layer plates was tested quantitatively. The sum of the vertical and horizontal diameters of the zones of inhibition of *Penicillium expansum*, and the square root of the weight of an equal area of paper, were directly proportional to the logarithm of the concentration of MBC. Methanol and ethanol extracted significantly more MBC from tobacco tissue than acetone and chloroform. Soxhlet extraction was more effective than cold (22°C) treatment, but the latter, in which 100 mg aliquots of dried tissue were used, was the least variable, very much quicker and could be used to detect the fungicide in small amounts of individual plant tissues. (Author abstract by permission)

75-0241. Glennie-Holmes, M. (Biol. and Chem. Res. Inst., Rydalmere, N.S.W., Australia). **The rapid determination of atrazine residues in soil using infrared spectrophotometry.** *Pestic. Sci. 5(3): 251-254; 1974.* (4 references)

A rapid method for the determination of atrazine (2-chloro-6-ethylamino-4-isopropylamino-1,3,5-triazine) residues in soil of low organic matter content is presented. The method, which is particularly suited to laboratory studies of leaching or degradation, has the advantage or rapid throughput as it requires no clean-up steps. A dehydrated soil sample is extracted with anhydrous chlorform at room temperature and the chloroform extract evaporated to dryness. The residue is redissolved in carbon disulfide and read directly in an infrared spectrophotometer over the region 850-750 wave numbers. Interference by different soil types, however, prevents its use in normal soil residue assays. (Author abstract by permission, supplemented)

75-0242. Crouch, R. V.; Pullin, E. M. (Res. Lab., May and Baker Ltd., Dagenham, Essex RM10 7XS, England). **Analytical method for residues of bromoxynil octanoate and bromoxynil in soil.** *Pestic. Sci. 5(3): 281-285; 1974.* (34 references)

A method is described for the analysis of bromoxynil and its octanoate in soil. The sample is extracted with ammoniacal methanol which, on standing, converts any octanoate present to bromoxynil. Diazomethane converts this to bromoxynil methyl ether which is estimated by GLC. Additional clean-up may be effected by TLC. With a 40 g sample the method can detect 0.05 mg/kg. Recoveries are better than 80% down to 0.1 mg/kg and about 55% at the limit of detection (0.05 mg/kg). (Author abstract by permission)

75-0243. Edwards, R. (H. J. Heinz Co. Ltd., Hayes Park, Hayes, Middlesex, England). **Some factors in the separation of polychlorobiphenyls (PCBs) from organochlorine pesticides by column chromatography combined with gas-liquid chromatography.** *Pestic. Sci. 5(3): 293-304; 1974.* (34 references)

Retention volumes for polychlorobiphenyls (PCBs) and organochlorine pesticides have been measured on "Florisil" and silicic acid in various activity states using petroleum spirit eluant. The majority of organochlorine pesticides can be separated from PCBs by column chromatography. The exceptions are heptachlor, aldrin and BHC (apart from the gamma-isomer), and the separation of DDE from PCBs was only achieved with highly active silicic acid. With PCB residues normally found, the separations not secured by column chromatography were obtained by gas chromatography. (Author abstract by permission)

75-0244. Ohno, M.; Takano, T.; Baba, N.; Kirihata, M.; Kawano, K. (Inst. Chem. Res., Kyoto Univ., Kyoto, Japan). **A new assessment of the phosphoric acid method for pyrethrum assay.** *Pyrethrum Post 12(2): 91-92; 1974.* (7 references)

The substrate-structure selectivity of the coloring

reaction of pyrethrins with phosphoric acid reagent was investigated using pyrethrins I and II, jasmolins I and II, and the related synthetic compounds. Only pyrethrins I and II colored the phosphoric acid reagent. Kenya pyrethrum flowers were assayed by the phosphoric acid method, using the 1972 World Standard Pyrethrum Extract (WSPE) as a control. Samples showing a higher combined percentage of pyrethrins I and II than WSPE also showed a higher total pyrethrin content than that indicated by AOAC. These values were corrected by multiplying by the combined percentage of pyrethrins I and II in WSPE and divided by the corresponding percentage for the test sample, as obtained by gas-liquid chromatography. Using this correction factor, fairly good agreement between the phosphoric acid and official methods was obtained, indicating that the shortcomings of the former can be satisfactorily eliminated.

75-0245. Mendoza, C. E. (Food Res. Lab., Health Protect. Branch, Dept. of Nat. Health and Welfare, Ottawa, Ontario, Canada K1A 012). **Analysis of pesticides by the thin-layer chromatographic-enzyme inhibition technique. Part II.** *Residue Rev. 50: 43-72; 1974.* (52 references)

This second review includes recent articles and that earlier literature not discussed in the first review. The emphasis in this second part is on the use of the thin-layer chromatographic-enzyme inhibition (TLC-EI) technique. The topic is subdivided as follows: (a) determination and confirmation of pesticides; (b) analysis of residues in plant, soil, and water samples; (c) forensic toxicology; (d) metabolism studies; and (e) detection of some chlorinated benzenes, phenolic compounds, heavy metals, and phosphatase inhibitors. Some aspects of quantitative methods are also discussed. An alphabetical list of organophosphorus and carbamate pesticides is included to serve as a quick reference for the compounds that have been analyzed by the TLC-EI technique and that have been mentioned in both reviews. Organochlorine pesticides were not summarized since there were only about a score studied by TLC-EI techniques. (Author abstract by permission)

See also 75-0061

75-0246. Eberle, D. O. (Agr. Res. Develop. Dept., Ciba-Geigy Ltd., Basel, Switzerland). **Diazinon. I. Analysis of technical grade product, formulations, and residues.** *Residue Rev. 51: 1-35; 1974.* (147 references)

Analytical methods for the determination of residues, active ingredient, and formulations of diazinon are reviewed and presented. The technical material may be analyzed by perchloric acid titration whereby basic byproducts are removed prior to titration by column chromatography. Gas chromatographic methods can also be applied successfully to the determination of technical grade diazinon. Analytical results obtained by the two procedures correspond very well. Both methods are suitable for all types of formulations: emulsifiable concentrates, wettable powders, dusts, and aerosol sprays. Extraction and cleanup procedures for residue analysis followed by methods of determination such as total phosphorus, polarography, cholinesterase inhibition, paper chromatography, thin-layer chromatography, and gas chromatography are reviewed. An improved method for residue analysis is recommended. In this method the active ingredient is extracted from crops and soils by blending with methanol. The extract is chromatographed on an alumina column to remove interfering materials. Quantitative measurements are made using a gas chromatograph with microcoulometric titration cell sensitive to sulfur, phosphorus thermionic detector, or electrolytic conductivity detector. (Author abstract by permission)

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

Pesticides Abstracts is available on 16 mm microfilm. Additional information can be obtained from the Technical Services Division.

ORDER FORM FOR
PESTICIDES ABSTRACTS

To: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter my subscription for Pesticides Abstracts. I am enclosing Money Order ☐ Check ☐ for this subscription.
($18.25 a year; $4.60 additional for foreign mailing.)

Please address as follows: _____

_____

_____

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 1968

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price, domestic, $18.25 a year, $4.60 additional for foreign mailing. Price for a single copy of this issue is $1.40, Index issue $2.35.

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
Technical Services Division
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

POSTAGE AND FEES PAID
ENVIRONMENTAL
PROTECTION AGENCY
EPA-335

Serials Department
Xerox University Microfilms
300 North Zeeb Road
Ann Arbor, MI 48106 EPA 18-1

If you do not desire to continue receiving this publication, please CHECK HERE ☐; cut off this label and return it to the above address. Your name will then be removed from the mailing list.

MISC.